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DEVOTED TO THE SCIENCE OF HOME LIFE, THE ARTS, AGRICULTURE, AND MEDICINE.

JAMES R. NICHOLS, M. D., EDITOR.

W. J. ROLFE, A. M., ASSOCIATE EDITOR.

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Familiar Science.

THE EYES AND SPECTACLES.

An old writer, living before the days of illuminating gas and kerosene, remarks that the "first sign of the need of spectacles is a tendency to bless the man who invented snuffers." In this age we should say that the first sign is to find one scolding about the publisher of his daily newspaper, who is charged with filling his columns with type growing every day more diminutive and indistinct. When a man or woman reaches the age of forty-five or fifty, it is generally found that some aid to natural vision is required. The discovery of this want is very liable not to be made soon enough, and the eyes suffer greatly in consequence. There is also a foolish pride which prevents some people from adopting spectacles after the discovery is made. There is no truth relating to vision more important, and which therefore should be more clearly understood, than this: that in every case of defective eyesight, whether it proceeds from advancing age or from congenital causes or from accident, artificial aids should be resorted to without delay. The tendency is in all, or nearly all cases towards irreparable injury, when this aid is withheld. It is true, bad or ill-adapted spectacles may and do cause injury, and so do improper medicines, or injudicious food or regimen. If proper care is used in selecting glasses, and the right ones are obtained, they strengthen vision, and the vigor of all the functions of the organs concerned in the phenomena of sight is increased. A child discovered to be "near-sighted" should be promptly furnished with appropriate glasses, and they should be selected if possible under the advice of a competent medical man or optician. In the case of persons who have passed middle life, as soon as it is noticed that the best artificial light is sought, or that letters grow apparently smaller or less distinct, or that the near point at which one can see distinctly is more than eight inches from the eye, the time for spectacles has arrived. In adopting them under these circumstances, we place an artificial lens outside of the eye to supplement the natural change of that within the eye, and by so doing, we add to the power and normal action of the whole optical apparatus. The use of spectacles enables the eyes to work comfortably without fatigue; and they should always be strong enough to effect this object. It is difficult to give any rules for selecting glasses, as there are many exceptions to be considered. The natural changes in vision come on gradually, and glasses need to be changed to meet this modification as age advances. At first the change is slight, and may not for several years after it commences be so marked as to become positively annoying. In the early periods of decay of sight, glasses having a focal length of 60 inches will usually suffice; later in life they must be changed for those of 40 or even of 10 inches.

Glasses of a focal length of 60 inches will require one to hold the object looked at at a distance of 14 inches. If at 14 inches the letters of a book are seen most distinctly, the focal length of the glasses is usually well adapted to those whose vision is slightly impaired. The distance should be quite accurately measured, as glasses of 10 inch focal length require a modification of the reading distance, of only about 3 inches less. The first spectacles should at first only be used for reading in the evening; and when no longer sufficient they may be superseded for evening work by others, and the first pair reserved for reading by daylight, or for writing, which requires less critical vision, more especially if ink be used that flows black from the pen.

Short-sightedness is a malformation of a somewhat serious nature, as short-sighted eyes are diseased eyes, and they require special treatment. Never allow a child or a friend thus afflicted to fall into the hands of "travelling quacks," or those who make loud claims to optical knowledge. In all large cities there are reputable medical gentlemen who make a specialty of the treatment of eye affections, and they are the proper persons to consult. It cannot be too universally known that short sight tends to increase; and that if it increase at all rapidly, it tends also to destructive changes, and therefore it is an affection which requires prompt attention.

Perfection of eyesight is essential to our welfare and happiness, and any one who neglects those precautions upon the observance of which its preservation depends, will find cause for deep repentance in later life. Young men and young women who suffer themselves to fall into the habit of reading by fire-light, or at a window by the waning light of evening, or at a considerable distance from lamps and gas-burners, are guilty of acts for which they must suffer. Parents should promptly interfere to prevent the formation of such dangerous habits.

In the use of glasses, the tendency is towards those which are held in place by a spring pressing upon the nose. This form is convenient, and will do very well for purposes other than for reading or writing, when prolonged use is required. The nip upon the nose is often painful, and creates uneasiness; and beside, the focus is liable to become disarranged. For these reasons and others, the glasses held in place by bows passing behind the ears are the best and safest for reading or study. The lenses should be of the best construction, and pure crown-glass affords a material better than "Brazilian" or other "pebbles." Avoid purchasing of any optician who claims that his lenses are constructed of pebbles, or crystal stones. If his claims were not false, he should be distrusted. The frames of spectacles should be of blue steel, light, strong, and perfectly fitted to the wearer. They should be kept perfectly clean, and this should be accomplished by the use of soft wash-leather, and not by linen handkerchiefs, which are apt to scratch the lenses by the small particles of silicious or other hard substances which they hold.

WATCHING THE GROWTH OF CRYSTALS.

The growth of crystals in an evaporating solution was finely displayed on the screen at some of Tyndall's lectures in this country, and was one of the most striking of the many beautiful illustrations he introduced. Any one who has a microscope, even of the cheapest kind, may amuse himself and his friends, "round the evening lamp," by similar exhibitions on a smaller scale. The formation of metallic crystals, as those of silver, gold, and tin, is particularly pretty. In the *Argonaut*, of London, a few months ago, there was a long and interesting paper on this subject, with several wood-cuts showing the forms of the crystals, which we should like to reproduce; but, after all, pictures give a poor idea of the beauty of the crystals as one sees them actually growing under the magic glass.

Their production is easy and simple enough. Get a solution of nitrate of silver at any chemist's; or, better, buy the solid nitrate of silver, and dissolve it for yourself in distilled or rain water — bearing in mind, however, that the salt has a way of staining fingers or clothes black, and the solution must therefore be used with caution. Put a drop or two of the liquid on a slip of glass, and place in it a little scrap of copper, or brass; you will see with the naked eye that the bit of copper becomes white at the edges, and covered with a hoary beard. But with a magnifying glass you will see that this beard consists of crystals of white silver, and you will be disposed to liken them to a rapid growth of vegetation, — mosses, or ferns, or the interlaced branches of pine-trees, or the tangled luxuriance of a tropical forest, according to the prevailing forms of the crystals; or, they may seem to you like the rapid uprising of towers and minarets and spires in graceful and varied architecture. If your microscope is a powerful one, you will be better able to examine the delicate tracery of this building, and to watch the sculpturing of the edges and the exact formation of the angles, with no visible tool to fashion them.

These crystals can be observed either by light transmitted from below — in which case a blue glass under them adds considerably to the beauty of their white branches — or they may be examined by reflected light. Sunshine shows them up magnificently, or the rays of a lamp concentrated upon them by a lens make them stand out in dazzling brilliance. Their beauty, too, depends in no small degree upon their movement; and as you watch a particular crystal, you will see new branches pushed forward, then perhaps

the growth will be arrested for a few moments, and again it will seem to run rapidly onward into the clear liquid beyond.

The forms these crystals take will depend very much on the strength of the solution. If it contains only about one per cent. of nitrate of silver, the copper will be covered at first with little black bushes of silver; but if it is stronger, the deposited metal will be brilliantly white, a five per cent. solution giving forms that resemble fern leaves or feathers. In a still stronger solution the symmetry of these structures is apt to be lost, owing to the stems being built up of a confused mass of hexagonal plates, covered with minute pointed crystals set in every direction. A fifteen per cent. solution will probably exhibit a steady growth of what may be compared to moss; and to each spray a rounded appearance may be given by a multitude of very minute hexagonal plates clustering together. A saturated solution of nitrate of silver (about forty per cent.) will exhibit an arborescent fringe, often terminating in solid crystalline knobs. But the forms, even in the same drop of liquid, will often vary a good deal. The last traces of silver in the liquid will frequently give rise to delicate crystalline filaments wandering over the surface of the glass.

"What fairy story," Dr. Gladstone asks, "gives food for the imagination like this? Every atom of silver was originally invisible in the clear nitrate; why does it suddenly become solid and visible? and how is it that each particle of metal is laid exactly in the right place to build up a symmetrical structure? The work proceeds silently as the building of Solomon's temple, during which, as we read, no sound of hammer or axe was heard, for every piece of stone or timber was shaped beforehand to fit its allotted place; but where were these pieces of silver fashioned to the plan of the Great Architect? and what forces do the work of Solomon's seventy thousand bearers of burdens? Some things we do know: every atom of silver added to the structure necessitates an atom of copper being dissolved, and between the surface of the copper and the ends of the silver branches there is a dance of atoms — a chain of molecular movement, which a cultured scientific imagination alone is able to perceive, and which would amply repay any investigator who might have the skill to unravel the mystery."

Some other metals give forms as beautiful as those of silver; as, for instance, those which tin assumes when a piece of zinc is dropped into solution of protochloride of tin. Acetate of lead on zinc gives rise to large lustrous leaves of metallic lead, while salts of copper yield black, chocolate-colored, or red crystalline fringes, according to the strength of the solution. This formation of black metal is indeed one of the most curious parts of the phenomenon; not only silver, lead, or copper may be obtained in this condition, but some other metals, such as bismuth or antimony, or the noble metals platinum or palladium, can scarcely be obtained of any other color by replacement.

But perhaps the most remarkable appearances are those of gold. Get some *neutral* terchloride of gold and make a solution of about ten per cent. in strength; put into it a piece of zinc, and you will see an immediate outgrowth of black metal, then the gold will push forward in lichen-like masses, green, lilac, or yellow, followed perhaps by yellow or black fringes, and ending in delicate arborescent forms. A yellow branch will often run rapidly round the edge of the drop. Dr. Gladstone compares this to "the movement of a yellow caterpillar." The gold salt is also apt to crystallize on the glass plate in long needles, and the metallic fronds follow up these long crystals, which disappear before them as though devoured by their advancing points.

Our limits forbid us to dwell on this fascinating crystal-culture, as we may call it, and those who make experiments in it for themselves will see how imperfectly we have described the few forms selected for illustration. Mere words cannot paint the rose or the lily, nor can they convey any adequate idea of the beauty of these exquisite chemical flowers as one sees them budding and blossoming in the field of the microscope.

THE LAND OF THE PYGMIES.

Among the old classical legends, one of the most prominent, both in poetry and prose, was that of the Pygmies, a nation of "small folk," reputed to dwell in the interior of Africa. Mention is made of them in the earliest Greek literature that has come down to us, and Homer refers to them as a race that had long been known. The old historians and geographers speak of their existence as a well-established fact. Herodotus, after describing the passage of the Nasamonians across the Libyan deserts, adds: "They at length saw some trees growing on a plain, and, having approached, they began to gather the fruit that grew on the trees; and when they were gathering it some diminutive men, less than men of middle stature, came up and seized them and carried them away." Aristotle also bears testimony on the subject in these explicit terms: "The cranes fly to the lakes above Egypt, from which flows the Nile; there dwell the Pygmies, and this is no fable, but the pure truth." But modern critics have assumed that either these old accounts were pure fable, or that their authors had mistaken the cynocephalous apes for a diminutive race of men. It was not until the recent explorations of Schweinfurth (whose "Heart of Africa," just reprinted in this country by the Harpers, is the most notable book of travel that has appeared for many a day) that the credit of Herodotus was vindicated, and the existence of the Pygmies established beyond a doubt. All the way on his journey southward from the western water-shed of the Nile, Schweinfurth heard wonderful stories of a race of little people dwelling far south of the territory of the Niam-niams. It was told of them that armed with strong lances they would creep underneath the belly of an elephant, and dexterously kill the beast, managing their own movements so adroitly that they could not be reached by the creature's trunk. In this way they were said to contribute very largely to the resources of the ivory traders. At length the traveller met with a colony of these little men, near the royal residence of Munza, king of the Monbuttoos, and was presented with a young specimen, whom he kept as a companion for more than a year. The doctor describes him as a repulsive-looking creature; and although he came in time to manifest some affection towards his protector, he was the most malicious and mischievous of all monkeys. In acuteness, dexterity, and cunning he was unequalled. He was always fond of torturing animals, and took a special pleasure in throwing arrows at the dogs by night. During the period in which the caravan was involved in war with hostile tribes, and while the servants were almost beside themselves with anxiety, nothing afforded him greater amusement than to play with the heads that had been severed from the slain. Schweinfurth was anxious to carry the boy home to Europe; but he sickened and died on the way.

These Pygmies are doubtless the most interesting of Schweinfurth's ethnological discoveries, but he has made us acquainted with the habits and characteristics of various other tribes before unknown. Some of these people are quite advanced in the elements of civilization and the mechanical arts, while others are nearly on a level with the brute creation. The Monbuttoos and the Niam-niams practise cannibalism; and this custom appears to be not incompatible with many good qualities. The Niam-niams, for example, are naturally affectionate and kind-hearted. The men treat their wives and children kindly, and will part with their most cherished possessions to ransom a friend from bondage if captured by slave-hunters or a hostile tribe; yet they will slay and eat a captive with the greatest zest. Their name signifies "great eaters." They spend their time in war, hunting, and the cultivation of the soil, and, for savages, they are very good farmers. Sweet potatoes, yams, and tobacco are their principal crops. Of tobacco they raise large quantities, and of excellent quality. They are inordinate smokers of the weed, using neat little clay pipes of their own manufacture. Schweinfurth remarks it as a curious circumstance that all the tribes of Central Africa cultivate the tobacco plant, and that its foreign origin is indicated by the fact that but one tribe, from the Niger to the Nile, has a native word of its own to denote it. The Niam-niams call the plant *gundeh;* but the Monbuttoos know it by the name of *e-taboo*, while other tribes ring every change upon the root word, as *tab*, *tabba*, or *tabdeet*. "Although the European traveller may not be able to eat the food prepared by his African entertainers, nor drink their curious decoction of herbs, he can sit down and smoke with them, and in this way, at least, enjoy a sense of the universal brotherhood of man."

HINTS FOR THE PRESERVATION OF OIL PAINTINGS.

We find in a recent number of the London *Furniture Gazette* an interesting article on the preservation of pictures, from which we condense a few practical suggestions for the benefit of our readers.

Dampness is one of the chief agents in destroying pictures, though of course not so troublesome in our climate as in that of England. It warps the panels, or corrodes the canvas, and causes the colors to peel off in scales. The air should always be allowed to circulate behind the entire picture. A light framework of wood may be used to preserve any work of value from the evil effects of contact with the wall, frequently damp, and sometimes impregnated with saltpetre and other deleterious salts.

The action of the sun is fatal and rapid.

The ravages caused by it are deep and sometimes irreparable. In a picture gallery it is well to have blinds to those windows which are exposed to the sun's influence, or to cover the glass with a dead whitish color.

As far as possible avoid placing candles near to the pictures. The greasy smoke of the candles, mingling with the dust and damp on the picture, forms a glutinous matter, which soon destroys the beauty of the coloring.

Dust and traces of damp should frequently be removed, and with extreme delicacy. For this operation it is best to employ old linen rags or an old silk handkerchief. The application of any kind of oil for the purpose of giving a momentary brightness to the picture must be avoided. This oil is absorbed by the coloring, and the canvas or panel, and it is impossible to prevent the picture from becoming blacker day by day. Oil employed in this manner produces on the picture a most disastrous effect. None but experienced persons must be permitted to wash or clean pictures. The use of soap is always attended with deleterious consequences, and must be invariably forbidden.

The choice of varnish is a most important question. Sufficient precautions cannot be taken as regards the ingredients employed in its composition since the advance in price of gum mastic. Bad varnish makes the surface of the picture cracky, and sometimes destroys it forever. The varnish ought, as a general rule, to be renewed every ten years, in order to prevent that cracking and drying of the coloring which precede the production of scales. A picture not protected by varnish becomes covered by dust, which the dampness of the atmosphere fixes and drives into all the pores, so as to change the general tone of the coloring, and increase the chances of perishing. The varnish should only be applied by competent persons.

FAMILIAR SCIENCE NOTES.

Cheap Furnace for Amateur Purposes. — An amateur chemist describes a home-made furnace which he has used successfully for two years. It is made from a piece of eight-inch stove-funnel, twelve or fourteen inches high, and furnished with a cap at the top, which can be removed at pleasure. At the bottom a small hole is cut in the side to receive the pipe from a blower, and the whole funnel is lined inside with pipe-clay mixed with clay. Three inches from the bottom the lining is increased in thickness and receives some bits of wire, which form a grate. The blower is eight inches in diameter and three wide, having four fans made of sheet iron, tin, or even pasteboard, as is also its case, and is driven by a small pulley belting from a larger one designed to be turned by hand. The whole arrangement can be secured to a board, that portion under the furnace being protected by sheet-iron. In such a furnace he has melted cast-iron and manganese in a few minutes. He prefers coke to coal, as giving a more intense heat.

A New Geissler Tube. — A new and simple electrical light has been devised by Dr. Geissler, whose "tubes" are already familiar to experimenters. It is an electrical vacuum tube, that may be illuminated without the aid of an induction coil. It consists of a tube an inch or more in diameter, filled with air as dry as can be obtained, and hermetically sealed after the introduction of a smaller exhausted tube. If this outer tube be rubbed with a piece of flannel, or any of the furs generally used for exciting the electrophorus, the inner tube will be illuminated with flashes of mellow light. The light is faint at first, but gradually becomes bright and softer. It is momentary in duration, but, if the tube be rapidly rubbed, the light is apparently continuous upon the principle of the persistence of vision. After educing signs of electrical excitement within the tube, one may entirely dispense with the use of flannel or fur, by moving a sheet of previously excited vulcanite rapidly up and down at a slight distance from the tube.

Danger in Diamonds. — In a paragraph in *Les Mondes* mention is made of explosive diamonds in South Africa. The explosion generally takes place during the first week of their exposure to the air, but cases have occurred of explosion three months afterwards. By coating the diamonds with tallow these accidents may be prevented, but a diamond which can only be preserved in this manner is evidently valueless.

HINTS AND RECIPES.

Removing Grease-Spots. — In taking out grease from clothing with benzole or turpentine, people generally make the mistake of wetting the cloth with the turpentine and then rubbing it with a sponge or piece of cloth. In this way the fat is dissolved, but is spread over a greater space and is not removed; the benzole or turpentine evaporates, and the fat covers a greater surface than before. The only way to remove grease-spots is to place soft blotting-paper beneath and on top of the spot, which is to be first thoroughly saturated with the benzole and then well pressed. The fat is then dissolved and absorbed by the paper, and entirely removed from the clothing.

To Transfer Pictures to Glass. — Engravings and lithographs may be transferred to glass as follows: Give the glass a coat of copal varnish and put aside till nearly dry, and only slightly tacky; apply the engraving face downwards on the varnish, and damp the paper with a wet sponge in order to get it to lie close to the varnish in every part; it must be again laid aside till the paper is perfectly dry; again damped with the sponge, and the whole of the paper rubbed off with the points of the fingers; washed in plenty of water to remove the particles of paper; allowed to dry hard, and finished by the application of a coat of copal varnish.

To Soften Hard Putty. — It is well known that common putty becomes exceedingly hard with age, which renders the removal of glass from sashes peculiarly difficult. A practical man tells us that he thinks himself lucky if he can take out one pane out of three without breakage. It is stated, however, that the putty may be softened by using a paste of caustic potassa, easily prepared by mixing the caustic alkali, or even carbonate of potash or soda, with equal parts of freshly burnt quick-lime, which has previously been sprinkled with water, so as to cause it to fall into powder. This is then mixed with water to a paste, and is spread on the putty to be softened. Where one application is not sufficient, it is repeated. In order to prevent the paste from drying too quickly, it is well to mix it with less water, adding some soft soap instead.

Blue-Black Writing Fluid. — The following is recommended as giving an excellent blue-black ink: —

Aleppo galls, bruised	4½ ounces.
Bruised cloves	1 drachm.
Cold water	40 ounces.
Sulphate of iron	1½ "
Sulphuric acid	35 minims.
Sulphate of indigo, in thin paste	¼ ounce.

Place the galls with the cloves in a fifty-ounce bottle, pour upon them the water, and digest, shaking often, for a fortnight. Press and filter through paper into another fifty-ounce bottle. Next, put in the iron, dissolved completely and filtered, then the acid, and shake briskly. Lastly, add the indigo, and thoroughly mix by shaking. Filter again through paper. No gum or sugar is required, and on no account must the acid be omitted.

Bleaching Flannel. — Flannel which has become yellow with use may be bleached by putting it for some days in a solution of hard soap to which strong ammonia has been added. The best proportions are one pound and a half of hard curd soap, fifty pounds of soft water, and two thirds of a pound of strong ammonia solution. The same object may be attained in a shorter time by placing the flannel for a quarter of an hour in a weak solution of bisulphite of sodium, to which a little hydrochloric acid has been added.

VITAL FORCE.

In building a crystal Nature makes her first real effort as an architect. Here we have the first gropings of the so-called vital force; but the most wonderful manifestations of this force, though depending on processes of higher complexity, are, I hold, of the same quality as those concerned in the growth of a crystal. Will the poet or the imaginative man shrink from these notions as cold and mechanical? Why should he? For what have we done but pushed the eternal mystery a little farther back? We reduce life to the operation of molecular forces; but how came the molecules to be thus endowed? Who or what gave to these forces their particular tendencies and direction? Let us contemplate that cycle of operations in which the seed produces the plant, the plant the flower, and the flower the seed again, thus returning with the unerring fidelity of a planet in its orbit to the point from which it started. All these processes are undoubtedly due to the action of molecular forces. But who or what planned their manner of action? Who or what endowed them with the power of taking up at a given time a determinate position, to be followed by another and another through the course of ages? Yonder butterfly has a spot of orange on its wing; if we look into a book written a hundred years ago, where that butterfly is figured, we find the self-same spot upon the wing. Now the spot depends purely on the manner in which the light falling on and entering the wing is discharged from it, and this again depends upon the molecular structure of the wing. For a century, then, the molecules have gone through successive cycles; butterflies have been begotten, have grown, and died, and still we find the architecture the same. Is not this amazing? And what is the explanation? We may have a thousand proximate reasons, but at bottom we have no explanation. Still we stand firm within our range. There is nothing in the architecture of that wing which may not yet find its Newton to show that the laws and principles brought into play in its construction are qualitatively the same as those brought into play in the construction of the solar system. There is no essential distinction between organic and inorganic; the forces present in the one, when duly compounded, can and must produce the phenomena of the other. Thus far do I proceed with absolute confidence; and I am ready to take a step farther. The brain of man itself is assuredly an assemblage of molecules, arranged according to physical laws; but if you ask me to deduce from this assemblage the least of the phenomena of sensation or thought, I lay my forehead in the dust and acknowledge human helplessness. Here speculation folds her wings, for beyond this point there is no medium to sustain her flight. — *Tyndall's Lectures on Light.*

It has been shown by Carius that, contrary to the views held by chemists, ozone is absorbed unchanged and in considerable quantity by water.

Practical Chemistry and the Arts.

A SINGULAR CASE OF CORROSION OF A TIN TANK.

BY S. P. SHARPLES.

[Read, May 12, 1874, before the American Academy of Arts and Sciences.]

In June, 1872, I received a letter from the Collins Company, of Collinsville, Conn., of which the following is an abstract: —

"This company has a hotel building in this place, supplied with very good spring water, which is conducted through say 100 feet of lead pipe, from the cement pipe main in the street, to a very large tank or reservoir on an upper floor in the hotel. From this tank water is distributed all over the house, through lead pipes. Water is continually running into the tank, and of course is freely drawn off to the various points. The tank is lined with what the plumber calls pure block-tin. We observe that the water deposits white streaks, at various levels, around on the lining. Enclosed we send you a specimen of the tin lining and the white deposits or powder.

"A waste pipe, 9 feet long by 2 inches in diameter, is within the tank, and subject to the action of the water.

"Is the white powder from lead or any corrosive metal?"

Subsequently they forwarded me specimens of the water taken from the spring, from the place where the lead pipe discharged into the tank, and from the place where it was drawn for use in the house.

The water taken directly from the spring was examined, and gave 5.3 parts inorganic matter, and 2.5 parts organic matter, to the 100,000 parts of water.

The inorganic portion was mainly carbonate of lime, with a little sulphate of lime and chloride of sodium. The specimens of water drawn from the lead pipes were entirely free from even traces of that metal. The white powder referred to was found to be oxide of tin, with a mere trace of iron. I accordingly reported that I did not think any harm would arise from the use of the water, — as the water was a pure one, and free from lead, — and that oxide of tin was not regarded as injurious.

On the 27th of March, 1874, the superintendent of the works again wrote as follows: —

"We enclose specimens of the lining of the tank which contained the water, of the purity of which we were suspicious. We may be mistaken, but it does seem to us that the lining has been destroyed by the action of the water, in a most unusual manner. The tank lining has lasted only five years. There has been a free and ample circulation of fresh water constantly in use in the daytime, at the hotel where our tank is located; and yet, for some cause unaccountable to us, the lining (which is block-tin) is perfectly riddled by corrosion, and must be replaced by a new one of some kind."

In answer to further inquiries on my part, he forwarded another specimen of the water, and a large piece of the lining of the tank, and further wrote: —

"The water is collected at the spring, in a sheltered and ventilated reservoir, with cement lining, and is conducted therefrom in a large cement pipe through our main streets. House pipes of lead are attached all along."

The water from the end of the pipe, where it discharged into the tank, was again analyzed, with the following results: —

Inorganic matter, 4.20; organic matter, 0.80 parts, in 100,000. Was perfectly free from nitrates; and, as the analysis shows, was rather better than when first examined. The lining is commercial block-tin, containing less than 2 per cent. of impurities.

Instances of corrosion of lead are not uncommon; but I have failed, so far as I have investigated, to find a case parallel to this. Professor Chandler,[1] in an article on the use of tin-lined lead pipe, says, in speaking of such pipe: "Waters which take up one to two tenths of a grain per gallon from lead pipe are not perceptibly affected by remaining for considerable lengths of time in the tin-lined pipes." And in another place, Mr. Cassamajor[2] states that tin is slightly more electro-negative than lead; and that it at first starts a feeble galvanic current, which serves to cover the lead with a coating of oxide, and then all action ceases.

Dr. Lankester[3] states, in regard to the tin-lined lead pipes: "I have tested these pipes with great care, and have exposed them to the action of water of various kinds. In no case have I discovered in the water the slightest trace of lead or tin. I have submitted the pipes to the action of distilled water, Thames water, water from artesian wells in London, and to water highly charged with organic matter; and in no case, where these waters have been exposed to the usual reagents for detecting the presence of tin or lead, has the slightest quantity of these metals been detected."

Field[4] states that tin does not oxidize at ordinary temperatures in the air, and but very slightly in water, retaining its metallic lustre for a long time; and, again, it is not sensibly affected by the combined presence of air and moisture.

This extensive corrosion of the metal seems, therefore, to be a hitherto unrecorded circumstance, tin being generally regarded as the least liable to change of all our common metals. The metal, as will be seen, is entirely eaten through in some places.

1 *Am. Chem.*, vol. ii. p. 282.
2 *Am. Chem.*, vol. i. p. 3.
3 *Am. Chem.*, vol. ii. p. 27.
4 *Watts' Dict.*, vol. v. pp. 803, 804.

OLEOMARGARINE OR BUTTERINE.

We have already described the process of manufacturing the artificial butter known as "oleomargarine" or "butterine." The substance has been introduced into England from New York, and Dr. J. Campbell Brown, in the *Chemical News*, makes it the subject of an interesting paper, from which we cull the following paragraphs: —

Its general appearance, taste, and consistence are very similar to those of ordinary butter; but, notwithstanding that its solidifying-point is lower than that of some butters, it retains much of the peculiar crumbly texture and fracture of dripping. . . . . It softens at 78° F., and melts at 86°; when heated and slowly cooled, it obscures the thermometer at 62°, and solidifies at 60°. It contains —

Water	11.25 to 8 5
Salt	1.03 to 5.5
Curd	0.57 to 0.6
Fat	87.15 to 85.4
Coloring matter	— —
	100.00

The fat consists of olein, palmitin, margarin (?), a trace of stearin, and about 5 or 6 per cent. of butter. When dissolved in about four times its weight of ether, and allowed to evaporate spontaneously, it does not deposit any fat until more than half of the ether has passed off, and, if the temperature is not below 60°, the deposit is not solid. The first deposit, when dried, fuses at 108°; the second deposit fuses at 88°, and solidifies at 64°.

Under the microscope, butterine does not appear to consist of acicular crystals of fat, but of irregular masses containing a few butter globules, particles of curd, and crystals of salt. With polarized light, the irregular crystalline structure is beautifully seen, and is clearly distinguishable from butter which has been melted and recongealed. When old and rancid, it acquires the odor and taste of dripping, but it keeps longer undecomposed than butter. When fresh, it is a wholesome substitute for real butter, and, if not brought into the market as butter, no one can reasonably take exception to its sale.

Butterine may be detected by the following characters: —

1. Its crumbly fracture.
2. Its loss of color when kept melted for a short time at 212°.
3. The behavior of its ethereal solution.
4. Its action on polarized light.

TESTING THE COLORS OF WOVEN FABRICS.

The *Manufacturers' Review* translates from Professor Stein the following summary of directions for testing colors for their fastness: —

Red Colors. — A small sample of the yarn or fabric is boiled first in soap water, which should not affect the color, and become but slightly colored itself; secondly, in lime-water, which also should neither affect the color, nor extract it. These tests are sufficient to demonstrate the presence or absence of logwood, sanders, and aniline colors.

Yellow Colors. — Boil samples successively in water, alcohol, and lime-water. Colors which are not fast enough color the water and alcohol sensibly, and turn the lime-water red. Annatto and turmeric are the most fugitive yellow colors; fustic is a little faster.

Blue Colors. — (1.) Boiled in alcohol, a fast blue color should not give a red, purple, or blue liquid. (2.) Boiled in muriatic acid and water, or alcohol, the liquid should not color red, nor should the color on the yarn or fabric change to red or reddish-brown.

Purple Colors. — The only fast colors of this class are those derived from combining a vat blue or indigo carmine blue with cochineal, and the madder purple. Boiled with dilute alcohol (one half water) and left to stand ten or fifteen minutes, fast purples suffer no change; nor should they turn brown or reddish-brown when boiled with dilute muriatic acid.

Orange Colors. — Boil in water; if it becomes yellow, reddish-yellow, or red, the color is not fast. If the water remains unchanged, boil in alcohol, which should likewise leave a fast orange unaltered.

Green Colors. — Boiled in dilute alcohol, they should not color it blue, green, or yellow; muriatic acid should not be colored red or blue.

Brown Colors. — It is quite difficult to test these colors for their fastness. Boiling water should not change them to red; when steeped in alcohol, they should not become yellow.

Black Colors. — Boiled in water and hydrochloric acid, they should not be colored yellow.

LABORATORY NOTES.

Preparation of Carbonic Acid by Fermentation. — When it is desired to obtain a continuous current of carbonic acid gas for certain laboratory experiments, as in the preparation of bicarbonates, Stolba recommends the use of a fermenting solution of cane sugar. The sugar is dissolved in four parts of water, and sufficient yeast added to induce fermentation. By raising the temperature the fermentation is hastened, by lowering it it is retarded, so that by choosing a suitable place the fermentation will go on with the desired rapidity. The solution foams and swells up so that a very large vessel should be employed. The fermented substance may afterwards be distilled and the alcohol obtained. The gas only requires to be washed through water, and for this purpose a Liebig's or Mitscherlich's potash bulb can be employed, and

wired to the neck of the generator so as to render the apparatus very portable.

If molasses be used instead of sugar, it is to be diluted with three parts of water, and the gas washed by passing first through sulphate of iron solution to remove the nitric oxide generally formed, and then over pieces of wood charcoal free from dust, so as to render the carbonic acid odorless.

Purification of Chlorine Gas. — Whether chlorine gas be prepared from hydrochloric acid, or from common salt and sulphuric acid, by means of black oxide of manganese, some hydrochloric acid gas frequently goes off with the chlorine and is with difficulty removed from it. To remove it entirely, Stolba recommends the use of a concentrated solution of sulphate of copper, after passing through which the chlorine is washed with water again. The chlorine should pass slowly through the copper solution, in which are some pieces of pumice soaked with the solution. The copper salt has a great tendency to unite with hydrochloric acid to form chloride of copper and free sulphuric acid, and on this property depends its use for the purpose proposed.

MEMORANDA IN THE ARTS.

A German Sausage Factory. — We have referred more than once to the *erbswurst*, or pea-sausage, which was so thoroughly tested in the Franco-German war and proved to be a convenient and nutritious article of soldier diet. A factory for preparing it, capable of supplying rations to an army of 55,000 men, is now in course of erection at Mayence. The initiative in this system was undertaken by Manteuffel, and a lively interest is shown in German military circles on the subject. If the results are satisfactory, an establishment of the kind is to be erected for every *corps d'armée*. The works of Mayence will contain steam flour-mills, bake-houses, slaughter-houses, and washing and pumping plant. The steam flour-mills will turn out 7000 cwt. of flour daily, and there is sufficient accommodation in the house, with its kneading machines and continuous ovens, for manufacturing this quantity of flour into bread. The slaughter-house is large enough to slaughter and deliver, ready for manufacture into food, 170 oxen daily, or at least 1000 per week to the prepared food department, which, besides this, will manufacture prepared vegetables. Forage rations for the horses of an army of the size named will also be supplied by the works. The opening of the establishment is fixed for about the beginning of 1875.

A New French Rifle. — A gunmaker of Limoges has submitted to the military commission at Vincennes a rifle of very novel construction. It is thus described in a Paris journal: The new gun presents nothing remarkable exteriorly, but the lock is so arranged that the breech is opened by cocking the piece, and the charge being introduced, the breech is closed and the gun fired by touching the trigger. The cartridge consists of a hollow leaden cone filled with powder, and closed at the base by means of a piece of cork. At the moment the cartridge is introduced into the breech the powder escapes by a small hole in the cork, and an imperceptible ball of fulminating powder, which forms the priming, takes its proper position. The triple action of cocking, loading, and firing is thus effected simultaneously, so that a man with very little experience can fire twenty rounds a minute. The cartridges are stored in an iron tube, which is placed parallel with the barrel, and contains thirty balls, so that the piece may be fired as many times almost without any interval, and without removing the stock from the shoulder, as there is nothing to be done but to cock and pull the trigger.

A New Thing in Railway Construction. — The following is from *Iron*: "Mr. Charles Jordan, of Newport, Monmouthshire, proposes to stop one extensive source of railway accidents in what is certainly a thorough manner. His idea is to make the up and down main lines without the usual switches, turnouts, and crossings, the lines being continuous, from end to end, and to work such road by transferring a train or trains at stations, or where shunting is necessary, or at junctions with other railways, from the main line to the adjacent siding, by lifting the train bodily from one line to the other. The lifting will only be an inch or two, and the hydraulic apparatus as now constructed will make nothing of the weight, while, as to time, Mr. Jordan calculates that a few minutes will suffice to transfer a train from one road to another without disturbing a single passenger. The whole work of a station, as regards the hydraulic apparatus, may be done by one, or, at large stations, two lads. The time saved in shunting will be very great, and the risk of collision reduced to the lowest possible point, where Mr. Jordan's plan, for which he has taken out a patent, is adopted."

Agriculture.

GUANO.

The complaint is frequently made by farmers and others that the guano sold by dealers during the past three or four years has not been of as good quality as that formerly supplied. It should be understood by purchasers of artificial manures, that the Chincha Islands guano is no longer obtainable, the supply having been exhausted prior to 1872. The Peruvian government agents now ship from the Guanape Islands, and the quality is inferior to that brought from the Chinchas. Nearly the whole stock brought to this country and also that sent to England is Guanape guano, and should be sold as such. A few cargoes have come from Macabi Island, situated in the neighborhood of the Guanape Islands, but it does not differ essentially from the other. One objection to the Guanape guano is the hard, lumpy condition in which it is found on the islands. It is a difficult matter to get it into a suitable condition for efficient and economical use. Some cargoes recently arrived are, however, better in this respect. This guano usually contains about 22 per cent. of moisture, an important consideration to purchasers. Its plant-nutritive value may be understood from the statement that the average of several analyses gave of phosphates 28 per cent., and of ammonia 10 per cent. Occasionally specimens are found which afford 13 per cent. of ammonia, but the purchaser cannot count upon more than 10 per cent.

Guanape guano also differs from the Chincha Islands article in the form in which the ammonia is held in combination. Unfortunately it is largely held in the form of a volatile carbonate, and consequently it loses in quality on keeping. This is a disadvantage of no mean importance, inasmuch as in a few months' keeping in a warm place, one half the ammonia may disappear, and besides, when applied to crops in its fresh condition the caustic ammonia may burn and destroy them. It is due to the escape of this free ammonia that the article has such a pungent odor, a circumstance which some dealers make use of as a recommendation for their fertilizers.

We would recommend to those who use guano in considerable quantities, to mix with it gypsum or sulphate of lime in dry condition. This will not only fix the ammonia, but will tend to absorb the moisture and render its use more convenient. To get rid of the lumpy condition and also to improve and preserve the guano, it will be best to mix with it about 18 per cent. of oil of vitriol, and then keep it in a heap for several months, when it will be in condition to use. This process will add immensely to its value, and, although a little troublesome, it will pay to put it in practice. The sulphated guano can be kept any length of time, and the soluble condition in which the important fertilizing elements are placed renders it a very efficient and prompt agent.

Guano, to be effective, must be applied in a fine condition, and it must be evenly distributed. The Guanape guano is a valuable fertilizer, if it is properly cared for, treated, and used; otherwise it may be a waste of money to purcha e it.

RECENT INVESTIGATIONS CONCERNING THE FEEDING OF ANIMALS.

It is well known that herbivorous animals are fond of common salt, and this is as true of wild animals as of those domesticated by man. Carnivorous animals, on the other hand, either have no liking for salt, or show a positive aversion to it. Cats, for example, will rarely touch salt meat. This difference is not easily explained. The blood of both classes of animals contains a certain amount of soda salts, but the quantity of soda in a vegetable diet is not necessarily less than in one of flesh. A German experimenter, Herr Bunge, has been the first to suggest a plausible solution of the enigma. A vegetable diet furnishes twice as much potash in proportion to its soda as a flesh diet does, and it occurred to him that the greater supply of potash must be attended with a greater waste of soda. To test this theory experimentally, he put himself upon a perfectly uniform diet of beef, bread, butter, sugar, and a small quantity of salt. When, by daily analysis of the urine, he found that the quantity of soda and potash excreted had become constant, he proceeded to take such a dose of potash salts during the day as would raise the amount of potash in his diet to a level with that daily consumed by a herbivorous animal. The result was an immediate excretion of chloride of sodium in the urine, the amount being at once increased threefold. Much potash was of course also passed. The experiment was repeated at various times, employing different salts of potash, but always with a similar result, a dose of potash in every case producing an immediate excretion of soda. Bunge believes that this tendency of potash to produce a greater waste of soda in the system is the cause of the desire shown by herbivorous animals for common salt. Their vegetable diet is generally very rich in potash, and they instinctively seek an additional supply of soda.

Soda does not seem to be an essential ingredient of plants, but it is certainly indispensable in the animal economy. In muscle, and in the blood corpuscles, potash is an essential constituent; but in the fluid portion of the blood potash is actually injurious, and if injected, even in small doses, produces death. Soda salts, on the other hand, can be injected with safety, and their presence in the blood is essential to the continuation of vital processes.

The proportion of potash to soda is very dif-

ferent in different plants, even when growing in the same soil; thus, according to Peligot, potatoes and parsnips contain no soda, while beet-root always contains a good deal. It is evident, therefore, that some vegetable diets require the addition of salt far more than others.

Another of the mineral constituents of the animal frame has lately been made the subject of experiment. Since the principal constituent of bone is phosphate of lime, it is evident that a young growing animal needs considerable quantities of phosphate to meet the wants of the system. Lawes and Gilbert, in their experiments on pig-feeding, noticed that young pigs fed on maize alone, while gaining rapidly in weight, became diseased, large swellings making their appearance in the neck. This disease was stopped when a mixture of coal ashes, salt, and superphosphate (in the proportion of 20, 4, and 1) was supplied to the troughs; the pigs ate this with relish, and consumed of their own accord from 1 to 1½ lb. of the mixture per head per week. Maize is of all the cereal grains, rice excepted, the poorest in mineral matter, and in the case just mentioned, the mineral matter was evidently insufficient for the rapidly growing pigs.

Hofmeister has lately made some very complete experiments on the effect of an addition of phosphates to the food of lambs. Two lots of lambs eight weeks old were fed on hay and potatoes with a little salt, the object being to give them a diet poor in phosphoric acid. One lot received in addition gelatinous phosphate of lime, the other lot received none; the experiment was continued about seven months. The lambs that received the phosphate had a better appetite, and drank more water than the others, but their greater gain in weight was insignificant. Both lots were finally killed, and the bones examined. The bones of the lambs fed with phosphates were slightly heavier, and contained a little more mineral matter than the bones of those lambs which had no artificial supply of phosphate, but the difference was very small. It appeared from the experiment that the quantity of phosphoric acid in the mixture of hay and potatoes was really sufficient for the wants of the animal.

Hofmeister carried his experiment further, and determined what proportion of the phosphoric acid and lime in the food was actually digested and taken up by the sheep. He found that when feeding on hay and potatoes, an average of 37 per cent. of the phosphoric acid in the food was taken up, and nearly the same proportion of the lime. When gelatinous phosphate was added to the diet, all the additional phosphoric acid was taken up if the dose did not exceed 6 grams (about 95 grains) of phosphate per day, but beyond this point it was not all digested. He administered superphosphate to some old sheep, and found that with 10 grams (154 grains) per day the whole of the soluble phosphate was taken up, but with 20 grams only 64 per cent. was digested.

Weiske has made some experiments on the effects of phosphates upon young rabbits. He found no alteration in the composition of the bones from the artificial supply of phosphate.

It appears, on the whole, therefore, that the amount of phosphoric acid in ordinary vegetable food amply supplies the wants of a growing animal, except, perhaps, in extreme cases, as that of the pigs fed on maize.

FORESTS, AIR, AND SOIL.

Much has been written of late years on the physical effects of forests upon air and soil, and there have been some hasty generalizations on the subject which do not seem to be sustained by wider and more careful observations. But now that "forestry" is becoming — at least, in Europe — a recognized branch of science, and meteorological facts are being systematically recorded in all civilized lands, we are beginning really to understand how forests affect the climate of a region. An important contribution to our knowledge of the subject is the recent work of Dr. Ernst Ebermayer, of the Forest School of Aschaffenburg, giving the results of five years' observations at the seven meteorological stations in Bavaria.

With regard to the temperature of the soil he finds that at various depths down to four feet it is 21 per cent. lower on an average in the forest than "in the open," as our English friends concisely call it. This is preëminently the case in spring and summer, while in winter the difference is scarcely traceable. This shows that the effect of clearing is mainly felt in summer, and that it is greater as the climate is warmer. Diurnal range is felt only to the depth of three feet, and it is materially diminished by the presence of forest. The annual range of temperature is less in the forest than outside it, but the periods of the two phenomena do not agree very closely.

The effect of forests on the temperature of the air is similar to that just described, but the extent of the influence is only about half as great. The differences between the temperature above and under ground thus produced are of great importance as affecting the aeration of the soil, and the nutrition of the roots. The observations as regards height show furthermore that the temperature rises with the height at least up to the level of thirty or forty feet.

The tendency of forests is found to be to moderate the extremes of temperature, and so to render the climate less severe. This is a direct contradiction to the popular idea that the cutting away of our forests has made our climate less extreme than it used to be.

Becquerel's idea that trees warm the air is distinctly controverted by Ebermayer's results, which show that the temperature of the trees themselves is generally below that of air. In the winter the trees are colder than the soil, and in summer warmer: hence we see that the main seat of activity is in the roots in winter and in the branches in summer.

As concerns vapor Ebermayer finds that the existence of timber produces no difference in the absolute quantity present in the air; but evaporation from a free water surface is about 64 per cent. less in the forest than in clearings, and moreover it is far more ruled by the motion of the air than by the temperature. Hence we see the importance to young plantations which are likely to suffer from drought, of leaving belts of trees to shelter them. Anything which breaks the force of the wind retains moisture in the soil.

The evaporation from the soil is, however, a very different thing from that from a free water surface, and the brushwood, leaves, etc., which cover the ground, exert quite as great an influence in retarding it as the forest itself. It is found that for every hundred cubic inches of water evaporated from the soil "in the open," the ground in a forest, cleared of brushwood, etc., gives off only thirty-eight, and the uncleared ground, in its natural condition, gives off only fifteen cubic inches. Hence we see how immediately the water supply depends on the wood, and the fact confirms the old observation that in new and thriving settlements the springs dry up in proportion as the land is cleared.

It is a self-evident proposition that plants require rain, but Hellriegel has shown how much they require. According to him every pound of barley requires a supply of seven hundred pounds of water during the period it is in the ground. Trees require a different quantity from corn, and in addition they have a very great effect in draining the land, for it is found that land from which the timber has been entirely felled often becomes swampy, and only dries again when the new plantations spring up. This fact shows us that trees exert a constant demand on the moisture of the soil, so that over-drainage of the ground must seriously affect their growth.

It is then a most important matter to determine the effect of forest on moisture. Ebermayer's experiments lead him to the view that the idea of the effect usually attributed to wood in increasing rainfall is not fully justified, and that much which has been held to be due to the timber in a country is really much more due to the contour of the country itself. The influence of forests on rain is however much greater among mountains than in the plains; it is also greater in hot climates than in cold, and in summer than in winter.

The actual amount of rain which is collected on the ground in a forest is about three quarters of that which falls on the cleared land outside. The deficiency does not all remain in the tree-tops, as much runs down the stem; but it is found that the proportion retained by the foliage differs with the different character of the wood; thus it is greatest with conifers, and of all trees Scotch fir retains the most.

The usual proportion between evaporation from a free water surface and rainfall on the same surface during the year is that the former rather exceeds the latter. The evaporation from the ground is very different from that from a water surface, and so, as regards the soil of a wood, the proportion above mentioned is reversed, for the diminution of evaporation is less than that of rainfall. If however the wood be cleared of brushwood, leaves, etc., the rate of evaporation from the soil is seriously increased, and in fact in such a case the amount of water stored up in the ground against periods of drought falls below that in open land, owing to the fact that so much of the rain is intercepted before it reaches the ground.

These facts, it will be seen, are not only interesting to the scientific meteorologist and to the botanist, but they also have a practical value for the agriculturist and the landscape gardener. We have thought this brief summary of them might prove of service to some of the readers of the Journal.

THE STORING OF FRUIT.

Mr. T. Baines, a leading English gardener, in an article recently contributed to *The Garden*, has the following remarks upon this subject: —

As to the storing of fruit through the autumn and winter, it too often happens, even in private estab-

lishments, where the gardener is expected to produce apples and pears in good condition, so long as they are in season, that any sort of a place that can be called a fruit-room is thought good enough for the purpose. Yet I feel confident that four out of every five of such places are totally unfit for keeping fruit as it ought to be. There is nothing with which I am acquainted that is more susceptible of taint, not only from actual contact, but even from being near anything affected with mould, or in other ways in a state of decomposition. I have seen the flavor of a fine collection of apples and pears completely spoiled by being placed in a fruit-room, the shelves of which had begun slightly to decay. To preserve the natural flavor of these fruits, without imparting anything objectionable to them, as also to keep them from shrivelling, requires the atmosphere of the fruit-room to be balanced to a nicety. It is scarcely possible to place any material over dessert apples or pears without affecting their flavor; even wheat-straw, in the sweetest possible condition, perfectly dry, will frequently spoil the flavor, through the moisture the fruit gives off causing the straw to mould, even so slightly as to be only perceptible by a faint odor. No second-story apartments are fit for fruit-keeping, being too dry; the best fruit-rooms I have ever met with have been underground; a cellar in a thoroughly dry situation, where a sufficient amount of air could be admitted for a time after the fruit was gathered to dispel the moisture given off from it. I have in such a place often kept Alfriston and Bedfordshire Foundling plump and in good condition until the succeeding year's crop was gathered, which is considerably longer than these apples usually keep. . . . . Pears that are kept in drawers made for the purpose and shut up, I have always found to be strongly affected with the odor of the wood. Apples and pears are frequently kept plump and fresh in appearance long after their natural season for ripening, by covering them with bran, dry sand, or similar materials. Culinary apples so treated are passable, but dessert apples or pears are insipid and worthless.

Cautions concerning the Use of Paris Green. — Those who use Paris green for the extermination of the potato beetle should bear in mind that it is a most dangerous and deadly poison, and they cannot be too careful lest it prove fatal to "larger game" than the bugs. All packages of the substance should be plainly marked Poison. There is great danger in the mixing of this green for the potato bug, owing to the fine dust which arises in the process, which is inhaled, and also rapidly absorbed by the pores of the skin, especially if the person using it should be in a state of perspiration. To guard against this, the hands and face (particularly the nostrils) should be protected as much as possible, and should be carefully washed after working with it, or with any of the preparations of which it is an ingredient. As it penetrates and poisons wood, gets into the seams and crevices of articles made of metal and even into earthenware that is at all porous, it is important that all household utensils, or anything in barn or stable (which cattle or horses could have access to) in which the article may have been mixed, or from which it has been used, should be carefully set aside, and never again used for any other purpose. Malignant sores are not unfrequently caused by scratching the skin when itching or irritated from handling the green.

As an antidote for the poison, the free use of milk as a beverage is recommended, but hydrated peroxide of iron is better. Sores caused by the green should be well covered with this, as with an ordinary salve, and a teaspoonful in a wine-glass of water should be taken twice a day, internally, while working with the green. This remedy can be obtained from any druggist or chemist.

Boston Journal of Chemistry.

Jas. R. Nichols, M. D., *Editor.*
Wm. J. Rolfe, A. M., *Associate Editor.*

BOSTON, JULY 1, 1874.

WRITER'S CRAMP.

New diseases are developed with the progress of civilization, and "writer's cramp," or "pen palsy," is one of the most recent of them; or, at least, it is only within a few years that its existence has been recognized by medical men. So far as we are aware, the first really satisfactory discussion of its nature, its causes, and its cure was the series of three articles on the subject by Dr. G. V. Poore, which appeared, a few months ago, in the London *Practitioner*. In his opinion, the disease has had its rise since steel pens came into use, as these pens, with their hard points and rough friction over the paper, cause a greater strain upon the muscles of the hands than the quill does, while the writer has none of the opportunities of resting the hand which the frequent making and mending of the quill pen affords.

A similar affection of the muscles may be caused by piano-playing. Dr. Poore says: —

"A pianist of great eminence has informed me that after a prolonged practice he suffers from obstinacy of certain of the muscles which move the fingers. He finds himself incapable of accurately adjusting their movements, and is annoyed by an inability to strike the right note. This naturally irritates and worries him, and he finds that the mental condition thus induced only serves to make matters worse. A few hours' rest serves to restore the lost tone of the muscles, and on beginning to practice again he plays as well as ever."

The "pen palsy" is more common than one would suppose. Dr. Poore mentions ten cases as having occurred in his own practice within a year, and he gives engraved specimens of the handwriting of each of these in various stages of the disease. Of the symptoms he says: —

"In all of them there was distinct impairment of power in one or more of the muscles of pen-prehension, or the muscles which poise the hand; but in all of the cases there was a remarkable difference both in the muscles affected and the manner in which the weakness manifested itself. In four cases the most prominent symptom was tremor directly the attempt was made to write; in four others mere impotence to perform the act of writing was the only symptom; in one the act of writing was interrupted by the uncertain and irregular action of the muscles of pen-prehension, causing at intervals a peculiar quivering of the point of the pen; and in one other the attempt to write produced cramp-like contractions extending to many of the muscles of the fore-arm and arm. In more than half of these cases there was a feeling of fatigue, in some instances causing merely trifling annoyance, but in others amounting to pain, severe enough in one case to be described as excruciating agony. This pain was in every case distinctly the pain of fatigue, a wearing pain more or less continuous, not following the lines of nerve-distribution, and always aggravated by the attempt to write."

The kind of people who are most subject to the "cramp" are, as a rule, "over-anxious persons, and such as would be likely to use an excessive amount of mental stimulation for the production of muscular contraction." One case is recorded in which the disease was hereditary, and had passed through three generations.

In some cases the nervous irritation caused by the malady seriously affects the health of both body and mind. Thus Dr. Poore says: —

"One of my patients was in the most desponding state possible when he first came under my own observation, and was in fact upon the verge of suicide; and another had in a moment of fury taken a knife and stabbed his right arm at the wrist. It is needless to say that this secondary mental condition reacts upon the already damaged muscles, and that after its establishment the progress of the disease is rapid.

"I have seen one case in which prolonged writing produces neuralgia; and another in which a dull pain in the cervical region of the spinal cord follows prolonged efforts to write. In both cases the writing difficulty is extreme, and the worry and irritation it causes are excessive. The general health of these patients, especially when the disease has advanced, is generally below par. They are as a rule thin, their muscles are soft and flabby, and their sleeping power not good."

The *inks* in common use have much to do in causing the "cramp," and those who write a good deal should be careful to use only the best of ink, or such as flows easily and uniformly from the pen.

With regard to *pens*, there can be no doubt that quills are preferable to steel, though there is a great difference in the flexibility of the latter. If one writes much with steel pens, he should select those which come nearest in that respect to the quill; and the same may be said of gold pens. The manner of holding the pen is, however, of quite as much importance as the kind of pen used. On this point another writer gives the following directions: "to rest the forearm on the desk, and the point of the little finger on the paper, as a guide to his hand, holding the pen lightly between the thumb and two first fingers, and using those two fingers and the thumb as flexible members, and not as the inflexible jaws of a small vise." There is no surer way of straining the tendons of the arm than to write, as many do, at arm's-length, with only the point of the pen touching anything. One cannot write in that fashion with a quill, and should not do it with a steel pen.

It is also important to form the habit of writing with as light a touch as possible. The loss of this lightness of hand, and the tendency to "bear on," are among the first symptoms of the "cramp." One of Dr. Poore's tests is to make the patient write with a soft cork penholder, and see if the force employed is sufficient to bend it; and it often happens that the holder snaps at the first attempt to form a letter.

With regard to curative measures, Dr. Poore considers that *rest*, that is, rest from writing, is of primary importance: —

"If the disease is treated early in its course, and the patient is able upon its first appearance to abandon writing for a time, the muscles recover their tone, and he is able to resume his occupation after an interval of a month or two. Patients in whom symptoms of writer's cramp have ever appeared should always be warned that they will never be able to perform an excessive amount of writing, and that any attempt to do so may be followed by disastrous consequences. If his occupation be that of a writing clerk, it is, I think, absolutely necessary for his future happiness that his employment should be changed, perhaps not entirely, but lightened at least, by finding some employment which may alternate with the periods of writing. To allow a patient

with writer's cramp to continue his excessive writing is like allowing a dyspeptic to continue with the diet which we know is the cause of his dyspepsia. I may here perhaps remark that I believe there are very many cases of incipient writer's cramp to be found in public and private offices, and it is very common to find that a clerk begins to hold his pen in some queer way, merely because he gets on better with the new method than by the old."

He has little faith in liniments or external applications, except in so far as they tend to quicken muscular nutrition, and thinks that in instances where they are used the rubbing which accompanies the application is to be credited with the real benefit. He would at the first indication of difficulty prescribe that the steel pen be discarded and the quill used in its place, or else that the patient habituate himself to write with a fine, soft paint brush.

Aside from these merely mitigative measures, Dr. Poore's main reliance is on galvanism and rhythmical exercises of the affected muscles, and he thinks there can be no doubt that the nutrition of muscle is thus powerfully promoted. The strength of current employed is considerably less than would be required for muscular contraction, and just sufficient to cause a tingle at the end of the little finger when the circuit is broken.

In fact, his whole system of treatment is based upon experiments which show that the irritability and conductivity of exhausted nerves are permanently heightened and restored by a very mild current. With an almost unfelt flow of electricity movements of the half-paralytic muscles are easily performed, while a current sufficient to induce muscular contraction often destroys the last remnant of nervous power.

A SCIENTIFIC CATECHISM.

A CORRESPONDENT sends us the following list of questions, from which teachers who may have occasion to prepare examination papers are at liberty to make selections, as the catechism is not copyrighted: —

If lead runs when it gets hot enough, will it necessarily walk when it gets cold?

If mordants are used to set dyes, shall we all be set up when our aunts die?

If flame is a state of combustion, is "sparking" an outlying province of matrimony?

If tin "cries" when it is bent a little, what does it do when "struck heavy"?

If we shed tears, shall we renew them annually?

If matches are made in heaven, where do all the "poor sticks" come from?

Would sulphur be beneficial in the frequent eruptions that occur along the spine of the continent?

Do people "rust out with idleness" on account of too much iron in the blood?

If iron is a tonic, what will be the probable effect of ironing?

Why is the foot of a mountain so dirty, when it is so often washed?

Why is the mouth of a river always larger than the head?

Do acid people become so in consequence of the souring of the milk of human kindness?

If buoys rise because they are lighter than the surrounding element, do little boys rise and build the fires on cold mornings because they are lighter than their parents and big brothers?

Do iron wheels "bite" better on a warm day for the same reason that fish do?

If the styles of plants are filiform, are the summer styles of bonnets matronly?

What proportion of the bonbons sold on railway trains are pure carbon?

Is nitrous oxide in any way related to the knights of chivalry? If so, how much?

If madder makes a lovely red, will anger make one feel blue?

Will a druggist make a good artillerist on account of his long-continued mortar practice, or a good juryman on account of his scruples, and will he maintain his business standing if he forsakes his drams?

Given the combining number of sal soda, at what age will Sarah be married?

Are Aniline and Benzine members of the same family, or are they merely second cousins?

CHEMICAL NAMES.

PROFESSOR MERRILL'S able essay on this subject in the May number of the BOSTON JOURNAL OF CHEMISTRY awakes a long and painful train of thought. This most exact of the sciences, which seeks only for truth at whatever hazard, a science which employs algebraic symbols to express its exact meaning, is encumbered with a nomenclature at once cumbersome and ambiguous. Each year and each new compound named renders any reform in chemical names more difficult. If, as has been suggested, the centennial of chemistry is to be celebrated in 1874, may not this convention of the learned and thoughtful be petitioned to aid us in finding a way out of the woods? I cannot say that I like the prefix "acid" to indicate that only half of the hydrogen has been replaced by the metal, as in $HNaCO_3$, since it sometimes happens that such salts do not redden blue litmus. For that reason "hydrosodic carbonate" is preferable to "acid sodic carbonate."

There are, however, points of greater practical interest to be settled. In 1869 Schutzenberger[1] discovered a new sulphur acid having the composition H_2SO_2=H_2O,SO. As this contained less oxygen than sulphurous acid (H_2SO_3), and more than hyposulphurous acid ($H_2S_2O_3$), the rule in use for naming acids failed, and it was named arbitrarily "hydrosulphurous acid."

The name hydrosulphuric acid having been applied by some to H_2S, an inconsistency at once arose between the *ous* and *ic* acids by making the oxygen acid appear to be below the hydracid. This inconsistency might be overlooked as many other are, but alas! here come not one series of salts but two, the neutral and the acid salts, according to Professor Merrill. If both atoms of hydrogen are replaced by sodium we have Na_2SO_2, and if the acid be called hydrosulphurous acid this salt is sodic hydrosulphite. If only one is replaced, we have $HNaSO_2$, an acid sodic hydrosulphite, or, by analogy with $HNaCO_3$, "hydrosodic hydrosulphite," an expressive but cumbersome name. Hydrosodic sulphite is a good enough name for $HNaSO_3$, but why give to our neutral salt (Na_2SO_2) a name so easily confounded with it as sodic hydrosulphite, not to mention the similarity of the latter to the sodic hyposulphite ($Na_2S_2O_3$) used by photographers? By analogy

H_2SO_4 sulphuric
H_2SO_3 sulphurous
H_2SO_2

should be hypo-sulphurous, and that is the name given by Fownes, at the risk of confounding it with $H_2S_2O_3$ which has so long borne this name. I have called particular attention to this point because one of the hydrosulphites, $NaHSO_2$, seems likely to prove of value to the dyer for its powerful reducing qualities; and at the very outset it is being confounded with the old and well-known "hypo."

A satisfactory rule for naming the various compounds of nitrogen and oxygen, both hydrates and anhydrides, so that the same name should never apply to more than one compound, and which would be likely to be generally adopted by all our scientific men, would be most desirable.

Other points of equal interest, where striking anomalies now exist, will occur to every thinking man who has been baffled in his efforts to express his thoughts concisely and accurately without the use of symbols. Is it asking too much of the chemists who meet to celebrate the explosion of the phlogiston theory to beg of them to explode some equally erroneous expressions in the nomenclature of to-day?

E. J. H.

[1] *Zeitschrift für Chemie*, 1869, [2.] V, p. 545.

ADULTERATED MILK.

OUR milk inspectors and judges look pretty sharply after this style of fraud. Judge Ladd of Cambridge recently fined one man $75 for putting in 37 per cent. of water. A second one was fined $20, and the judge added the cost of the analysis to this fine, making in all $30, besides the court costs. A penalty of $200 has been assessed in Boston, but the case was a second offence.

The milkmen in this vicinity are very skilful. They can manage to keep the solid contents within half of one per cent. of the average amount, to keep the sp. gr. at 1.028, and furnish 7 or 8 per cent. of cream, and yet add 15 to 20 per cent. of water. The exact method by which this is done is unknown to us, but we are in search of information and may possibly be able to find the man who furnishes the material, which is described as being thick and brown, and costing $6 per gallon. S.

EDITORIAL NOTES.

ANOTHER GREAT ENGLISH AQUARIUM. — The city of Manchester has just established an aquarium near the Alexandria Park, in a well-frequented suburb. In the centre of the building is a saloon or hall, 150 feet in length, by 40 feet wide, and, from the floor to the ridge of the open span-panelled roof, 54 feet in height. The walls are lined with cases stocked with anemones, and in the centre space there are large glass tanks filled with river and lacustrine fishes. The corridors on the north and south sides of the building are lined with tanks filled with marine fishes and crustacea, and these large spaces constitute the main scientific feature of the exhibition. It is stated that the conditions of these tanks are rendered suitable for the different classes of fish by mechanical means, and the directors state that they have the deep sea or coralline, the laminarian, and the littoral zones which gird our seashores truly represented in their aquaria — with the ocean current, the tidal wave, ebb and flow, etc. The two deep-sea tanks measure 40 feet long, 10 feet wide, and from 8 feet to 10 feet deep. The tidal tanks are forty in number, varying in depth according to the characters of the sea-shore they are intended to represent. The exhibition tanks present a transparent frontage of upwards of 750 feet, being more than double that of any aquarium yet constructed. The sea-water is brought by train in barrels from Blackpool, a distance of about 40 miles, and a constant supply is maintained.

A VERITABLE DUNDREARY. — The Adulteration Act in Great Britain has of course met with no little opposition from those whose dishonest gains it interferes with, but Lord Dundreary — we mean Lord Portman — objects to it on economical grounds. He thinks that $500 a year is too much to pay for the services of a county analyst. The London *Chemist and Druggist* says: "Lord Portman, as chairman of the Dorsetshire bench of magistrates, is reported to have expressed a hope that that county would not do as Somerset had done, 'which had appointed at £100 a year a man at Bristol who would not be wanted.' Rather than that, his lordship was con-

tent that they should 'have a little water in their milk, or a little turmeric in their mustard, as they had been subject to for years past.' So while Somerset goes on paying £100 to 'the man at Bristol,' Dorset keeps its cash, swallows its dirt, and rejoices."

PUNCH ON LABORERS' COTTAGES IN ENGLAND. — Everybody remembers Mrs. Hemans's "Homes of England," to which *Punch* refers in a recent poem from which we take a few verses:—

"The cottage-homes of England,
How beautiful they stand"
(So once Felicia Hemans sang)
Throughout the lovely land!
. . . . . .
The cottage-homes of England —
Alas, how strong they smell!
There's fever in the cesspool,
And sewage in the well.
. . . . . .
The cottage-homes of England!
Where each crammed sleeping-place
Foul air distils whose poison kills
Health, modesty, and grace
Who stables horse, or houseth kine,
As these poor peasants lie,
More thickly in the straw than swine
Are herded in a stye?

There is a better type of English cottages, of course, and one which is becoming more common, but Punch's description unfortunately fits the great majority of these dwellings better than Mrs. Hemans's does.

IMPORTANT, IF TRUE. — According to a late number of *Les Mondes*, two French chemists have succeeded in converting the nitrogen of the air into ammonia without expense, without chemical manipulation, and even without human intervention at all, by the use of certain bituminous schists. These schists contain all the elements necessary for the growth of plants in much larger proportions than farm-yard manure. Sulphide of carbon is produced at the same time, and is said to be the only remedy for the Phylloxera.

RUSSIAN FOOD FOR SOLDIERS. — A German journalist says that the Khivan expedition has brought into notice a rival to the famous Prussian *erbswurst*, or pea-sausage. The Russian soldiers were fed chiefly on biscuits composed one third of flour of rye, one third of beef reduced to powder, and one third of sauerkraut also reduced to powder. The soldiers are stated to have had a great relish for this food, and their good health during the expedition is attributed in great part to the use of it.

ATOMS.

THE difficulty of finding good opportunities for the use of very large telescopes under an English sky may be inferred from the statement of Mr. Burton, assistant of the Earl of Rosse, at a late meeting of the Royal Astronomical Society, that "during the two years he had been at Birr Castle, there had only been some three hours of what he might call excellent definition for the six-feet reflector; so that they had generally been driven to observe with the three-feet reflector." — South America is also to have its International Exhibition, to be held at Santiago, in Chili, and to open September 16, 1875. — An exchange says that a Frenchman who was engaged for some time in a series of experiments for the Sprague's, of Providence, to extract some new dyeing qualities from madder, "did succeed in extracting some eighty thousand dollars from the celebrated Rhode Islanders, while they kept on getting madder and madder, until they were perfectly willing for him to die any way he pleased." — A mixture of eighty parts of bisulphide of carbon with twenty parts of petroleum essence (to be applied with a brush) has been patented in France for the purpose of destroying ants, bugs, fleas, etc., and their eggs, in furniture and elsewhere. — The dyeing of "Easter eggs" is now an important business in France, and it is interesting also as having first led to the use of albumen as a mordant. — A curious little book has just been privately printed in England, entitled "Bibliotheca Nicotiana — a First Catalogue of Books about Tobacco," and comprising the title in full of about 170 separate works of various dates, from 1547 to the present time, upon the properties and uses of the weed; it is edited by Mr. William Bagge, of Shirle Hall, Sheffield. — "Ten Years of Gentleman Farming at Blennerhasset, in Cumberland," by Mr. William Lawson, is announced as soon to be published in England, "intended to give a candid account of the costliness and the failures, but the ultimate success of his coöperative experiment in agriculture." — Ireland produced in 1873 a crop of 2,683,060 tons of potatoes, a large increase over the yield of 1872, though the acreage devoted to the crop had decreased. — Unsuccessful attempts have been made in Italy to raise the tea-plant, and the experiment is now to be tried in the southern districts of Sicily. — *Punch* considers that Sir Garnet Woolsey performed a great chemical feat in getting gold out of Coffee. — Lake Neuchatel, in Switzerland, has been stocked with 150,000 young trout. — The King of Belgium is building a sea-side residence at Ostend, to cost $50,000, which is not a third of what some of our Yankee "sovereigns" spend for a "cottage" at Newport. — The London *Chemist and Druggist* says it is impossible to have the last word with a chemist, as he always has a retort. — Vesuvius and the surrounding peaks were covered with snow on the 29th of April, which was not exactly in accordance with the popular notions of an Italian spring. — A country druggist the other day told his clerk that he could dispense with his services, and since then he has dispensed without them. — An ingenious photographer photographs the ladies' column of the London *Times*, reducing the announcements to a size which is just legible, and he sends them to the persons interested, with a modest request for a shilling if approved. — The "Scientific Record" in *Harper's Magazine* is an admirable compilation, and the illustrated articles of history and travel are always excellent. — A California paper says that an Oakland young lady entered a drug store lately and wanted to see the papers for a week back, and the intelligent clerk showed her a roll of sticking plaster. — The *Scientific American* often reproduces elegant pictures of modern English architecture from the London journals that make this subject a specialty. — *Hearth and Home* has passed into the hands of the Graphic Publishing Company, and under their management will again become an illustrated journal. — The length of underground railways now in operation in London is about twenty miles, and they are being extended in various directions; the additional track now in progress of construction being about four miles.

LITERARY NOTES.

THE APPLETONS have reprinted *The Great Ice Age*, by Professor Geikie, a work which has made considerable stir in scientific circles abroad. It is the most thorough discussion of the glacial epoch that has yet appeared, and the conclusions to which the author comes, especially with reference to the relations of man to this epoch, are of great interest. Astronomers place the period of greatest cold for the northern hemisphere about 210,000 years ago. At that time, as Professor Geikie tells us, all the north of Europe and America was covered with ice, which formed enormous glaciers filling all the valleys and pushing far out into the sea. Then came a warmer period when life was possible in the lowlands, and the woolly rhinoceros, the mammoth, and the great cave bear flourished in Great Britain, followed, as the climate grew still hotter, by the elephant, the hippopotamus, and the lion. Another change brought back the ice, and there seem to have been several of these alternations of cold and warm periods. It was during one of the latter, according to our author, that man first appeared in Britain, where he was the contemporary of the mammoth and the hippopotamus. Then the land sank down into the sea, and the last great period of cold came on, when the mountain-tops of Britain and Scandinavia were islands of ice in an Arctic sea. Later still the land was elevated again, and the reindeer, the moose, and kindred animals inhabited it, with a race of men more advanced than their predecessors, as shown by the greater finish of their stone weapons. This is the merest outline of the results that Professor Geikie has reached in this interesting volume. The American edition reproduces the maps, charts, and other illustrations of the original work.

The same house publishes *Wilkes, Sheridan, Fox: the Opposition under George III.*, by W. F. Rae, three historical monographs which together form a masterly sketch of "a transition time in English politics when popular rights were anew declared and secured."

Mr. H. C. Baird, of Philadelphia, has published *Tables for Qualitative Chemical Analysis*, with an introductory chapter on the course of analysis, by Professor H. Will, of Giessen; the second American from the ninth German edition, edited by Prof. C. F. Himes, of Dickinson College. The revision has been thorough, and two new tables by the author, embodying Bunsen's flame reactions, have been added, besides much valuable matter from the pen of the American editor. The standard character of the work is too well known to make any extended notice necessary. The price of this new edition is only $1.50.

The Science of Homœopathy is a new book by Dr. Charles J. Hempel, just issued by Roedericke and Tafel, New York. It claims to be "a critical and synthetical exposition of the doctrines of the homœopathic school," and coming from one who holds an honored position in that school and therefore "speaks by authority," it will have an interest alike for those who accept and those who reject the system. The subject is brought within the compass of less than two hundred octavo pages of large, clear type.

Hurd and Houghton send us a pamphlet by J. P. Putnam on *The Metric System*, giving the history of the system, the arguments in its favor, replies to the objections urged against it, with full tables of reduction, and a plate illustrating the leading weights and measures. It is the best popular presentation of the matter we have met with.

A new edition of *Mrs. Thaxter's Poems* has been issued by the same publishers, containing about twice as much as the pretty little edition of two years ago, and got out in even more tasteful dress. It will be found pleasant reading for all who spend their summer vacation by the sea.

And the same may be said of *Sea and Shore*, a poetic anthology whose character is indicated by the title, gathered with exquisite taste by an anonymous editor, and issued in a dainty pocket volume by Roberts Brothers. They have also reprinted Sara Coleridge's *Phantasmion*, which is perhaps the most poetic fairy tale in the English language. It has long been out of print, and almost impossible to find in libraries or anywhere else. A new edition of it will be welcomed by thousands. *Some Women's Hearts*, by Mrs. Louise Chandler Moulton, is to be commended as a collection of stories wholly free from "sensationalism," and as pleasing as they are wholesome in tone.

Dr. Clarke's "Sex in Education" has called out quite a number of replies, direct and indirect, the most notable of which are Miss Brackett's *Education of American Girls* (G. P. Putnam's Sons) and *Sex and Education* (Roberts Brothers). The former has a value independent of its criticisms of Dr. Clarke's book. Miss Brackett's essay on female education, which fills a hundred pages, is admirable, and eminently worthy of being made a book by itself. It ought to be read by every teacher of girls, and by every parent or guardian of girls. Of the other papers in the volume, the one by Dr. Mary Putnam Jacobi seems to us the ablest, though some of the others are notable as giving important facts bearing on the subject under discussion. *Sex and Education* is a smaller book, containing criticisms of Dr. Clarke from a variety of sources. Some of them are exceedingly severe, and in our opinion unjust; others, while denying the doctor's conclusions, give him credit for "nobleness of purpose," and recognize the fact that "he does not oppose the education of women, but only the present method of education." We hope at some future time to be able to refer more at length to both sides of this interesting discussion.

The Harpers have now ready the edition for 1874 of their *Handbook for Travellers in Europe and the East*. It has been revised throughout, and some portions — Switzerland, for instance — have been entirely rewritten and materially improved. New maps and plans of cities have been added, making the whole number now more than a hundred. The work may be had in one bulky volume of about a thousand pages, or in three volumes which are sold separately. This will be a convenience for tourists who are going over only a part of the ground, if indeed it be not so for all who use it. It may be found, with other new books, at Noyes, Holmes & Co.'s.

Estes and Lauriat have sent out No. 11 of their "Half-Hour Recreations in Popular Science," containing *Coal as a Reservoir of Power*, by Robert Hunt, and Professor Clifford's paper on *Atoms*; also the second number of "Half-Hours with Insects," by A. S. Packard, Jr. Both these series are excellent in their way, and we are glad to learn that their circulation is steadily increasing.

The Young People's Magazine is a new juvenile monthly, published by Wm. Guild & Co., 11 Bromfield Street, Boston, at the low price of $1.50 a year. The first number is neatly illustrated, and contains 64 pages of entertaining and instructive reading for the young. The cheapness and merit of the magazine insure its success.

Medicine and Pharmacy.

THE FUNCTIONS OF THE LIVER.

The subject of the course of "Croonian Lectures" recently delivered by Dr. Charles Murchison at the Royal College of Physicians, in London, was "Functional Diseases of the Liver." In the first lecture, by way of introduction to his subject, he gave an account of the functions of the liver in a healthy state, an abstract of which (condensed from the very full report in the London *Medical Times and Gazette*) we believe will interest our readers, as a *résumé* of what is at present known concerning this important organ.

In ancient times very crude notions were entertained as to the functions of the liver. Galen taught that it was the centre of animal heat, the venous centre, and the seat of sanguification, the radicles being the veins of the bowels. For sixteen centuries this doctrine prevailed, and even Harvey himself upheld it. But the discovery of the lacteals and thoracic duct, and of absorption through them, at once destroyed the importance which the liver had hitherto possessed, and reduced it to a mere organ for the secretion of bile. Although physiologists did not fail to wonder that the largest gland in the body should have this simple function and none else, yet this belief in its purely biliary action has prevailed until our own day. It is only within the last quarter of a century that physiology has restored to the liver the functions of which it had been deprived.

The functions of the liver are threefold. First, it is engaged in the processes of sanguification and nutrition. Long ago Magendie and others proved that assimilation was partly performed by this route. Much more recently Bernard and others have discovered the glycogenic function of the liver. Glycogen always exists in the normal liver, more abundantly during digestion, and especially four or five hours after a meal. It is probably derived chiefly from sugar and starch. The glycogen is stored in the liver cells. It is also derived, without doubt, from albuminates, for it increases after a purely flesh diet. Glycogen is not excreted in the bile, for the latter contains neither glycogen nor sugar. It is probably retransformed in some way into sugar, and reënters the blood; and in this very process of decomposition heat is evolved, thus connecting the liver with the generation of animal heat. Part only of the glycogen is decomposed in this way. It probably contributes much to cell-growth in the animal body, just as sugar does to cell-growth in plants. Glycogen has been found wherever there are active cells, and Hoppe-Seyler has shown that it exists in colorless blood-corpuscles as long as they possess the power of spontaneous movement, while it changes into sugar when this power is lost.

The participation of the liver in the process of sanguification is supported by an examination of the blood of the hepatic vein. The blood which leaves the liver is five or ten times more rich in colorless corpuscles than is the blood which enters it. The red corpuscles, also, of the hepatic vein are sharper in outline, and less soluble in water. There are also good grounds for believing that sugar and glycogen have an important function to perform in muscular action. Whatever, then, may be the other functions of the liver, there is no doubt that sanguification is one.

Secondly, the liver performs the function of the disintegration of albuminous matter. It is a blood-destroying, and blood-purifying, gland. The products of this decomposition pass out by other channels than the bile. There is, for example, little doubt that albumen and fibrine are disintegrated in the liver. Brown-Séquard has calculated that no less than eighty-six ounces and a half of fibrine are lost to the blood every twenty-four hours in its passage through the digestive organs and liver. There is evidence, too, that the liver is largely concerned in the formation of the nitrogenous matters eliminated by the kidneys. It has been abundantly proved that the amount of urea excreted is diminished by organic disease or destruction of part of the liver, as in cancer and abscess. Dr. Parkes found by careful investigation, that the deficiency of urea, and the extent of liver-substance destroyed, were in direct proportion to each other. In the early stage of liver disease, on the other hand, when the gland is congested and its functional activity increased, there is a rise in the amount of urea excreted. These circumstances point to the intimate connection between urea and the functions of the liver. But this has been more positively indicated by the results of recent experiments, which prove that urea can be largely formed in the liver, and that it may be actually found there. The blood contains more urea after passing through the liver; urea is more abundant after digestion; and lithic acid, which represents urea in birds, may be found in the livers of this class of animals. Everything, therefore, seems to point to the liver as connected with the disintegration of albuminous matter, the products of which are excreted by the kidneys. All these processes are attended with a production of heat. The liver has a healthy temperature of 104° to 106°, and the temperature of the hepatic vein is higher than that of the portal. So that after so many centuries we return to the position of Galen, and accept the liver as one of the centres of animal heat.

The third function of the liver is the secretion of bile, which is a highly complex fluid. The quantity of bile secreted by a healthy animal has been found to increase during digestion. Taking an average of the results obtained by the best experimenters, we find that a man of 160 pounds probably produces about forty ounces of bile in twenty-four hours. The exact amount of bile secreted must, however, vary considerably with the person and his circumstances. It must not be forgotten that the amount of bile excreted is a very small proportion of that secreted. According to Berzelius, only about one fortieth of the bile is actually discharged from the body. The remainder is undoubtedly reabsorbed on its way along the intestine. This process is part of the great osmotic circulation which goes on between the contents of the alimentary canal and the blood, and which is most abundantly represented by the secretion of gastric juice and saliva, and the fluids poured out by the pancreas and the glands of the intestines. All these pass again in great measure into the vessels, and the process well deserves the name of "the intermediate circulation." In the intestines the bile assists digestion; it aids in the absorption of fat; it facilitates the absorption of albuminous substances by precipitating peptones; and it seems to have some effect upon the formation of glycogen. It also stimulates the peristaltic movements of the intestine, and prevents decomposition. Part, as has been said, is excrementitious.

CHEAP CINCHONA FOR INDIA.

How to supply cinchona to the people of India in a cheap form, and in sufficient quantity, is a problem which at present is exercising the minds of medical men and government officials in England. The London *Medical Times and Gazette* considers that "the object is to be attained in two ways, which must supplement each other: first, by the manufacture of alkaloids from bark on the spot; and second (for some years to come, at least), by the purchase of the febrifuge in the cheapest available form in Europe." The writer goes on to express surprise that, as a matter of economy, the other alkaloids are not more extensively used as a substitute for quinine. "With reference," he says, "to this means of supplying the people of India with the febrifuge, — namely, the purchase of the cheaper though equally efficacious alkaloids in this country, — the valuable reports of the Cinchona Commission, appointed by the government five years ago, seem to have borne little fruit. It was the unanimous opinion of the medical men who investigated the question with praiseworthy care and diligence, that the three other cinchona alkaloids that were supplied to them were almost, some thought quite, as efficacious as quinine, except that *cinchonidia* did not sit so well on the stomach. Yet cinchonine, cinchonidine, and quinidine, have only been indented for in very small quantities since the date of the report of the Commission."

Probably physicians in India continue to use the costlier quinine, as many of their brethren do in this country, merely from habit or from a reluctance to give up their faith in the old "authorities," even when they are proved beyond dispute to be in the wrong. Quinia has been reckoned king of the cinchona alkaloids, and the other members of the family have been counted as "poor relations," unworthy of decent regard, and though the latter are now raised to equal rank with the former, it is hard for them to secure their just rights. They are still treated as plebeians and pretenders by many, through sheer force of habit, or, as some would say, "old-fogyism." But they are steadily winning their way to a fair appreciation, and the next generation will wonder that their merits could ever have been matter of doubt or discussion.

ANILINE POISONING.

Dr. I. Walz, the editor of the *Manufacturers' Review*, after reading the account of the apparent case of poisoning from aniline dye reported in the Journal for May, wrote to Dr. Bidwell and obtained "a mitten manufactured from the same yarn and dyed with the same dye as the pair in question, which latter had been lost." The results of his examination of the mitten, as given in the following extract from his article on the subject, are interesting, and perhaps help to explain why fabrics dyed with these colors, though used so extensively, appear to be poisonous only in exceptional instances: —

"The portion of the mitten sent was carefully

examined in our laboratory, and it was found, firstly, that the dyestuff contained apparently a larger quantity of arsenic than usual, considering the precipitate of arsenate of magnesium and ammonia obtained from a piece about one and a half inches square. It was established, however, — and this, we think, is a most important point, taken in connection with the admitted natural sensitiveness of the patient's skin, — *that the fabric was overcharged with the aniline dyestuff;* in other words, more dyestuff had been used than was necessary to produce the deepest shade, and the mittens had not been carefully rinsed. This was proved by the fact that warm water extracted a considerable quantity of the dyestuff from a portion of the mitten, while, after drying, the latter was found to be still as deeply colored as the portion which had not been treated thus. This is a fault not unfrequently made by dyers, and is reprehensible even from the manufacturer's point of view, because it involves a waste of dyestuff, and leads to the 'crocking' of the color.

"We hope that the continued agitation of this question will lead to the careful study of other cases, and we have no doubt that if the physicians and chemists will coöperate, much light will be thrown on this, as yet, ill-understood question. . . . The manufacturer is as much interested in getting at the truth in regard to the sanitary influence of dyes as the general public, for he cannot afford to produce an article which is apt to become discredited and unsalable, and which would ruin his standing and reputation."

GOOD ADVICE TO MEDICAL GRADUATES.

Professor E. R. Palmer in his recent address to the graduating class of the Louisville Medical School (published as a supplement to the *American Practitioner* for April, 1874) gives the fledgling physicians some sensible advice concerning their professional ways and habits, from which we take the following extract: —

I am speaking to men most of whom will live apart from the bustling life of large cities, in regions where spare time is apt to hang idly on one's hands, and I know the nature of the temptations that will at such times beset them. Let me sketch you a picture of one of these temptations, and in contrast with what I have been advising. Each of you can easily add the finishing touches. It occupies the foreground of a typical village. A country store; before the door a long, low bench, well notched by industrious pen-knives; a broken chair or two on either side; and yonder, standing demurely at the hitch-rail, a saddle-mare, well laden with the household goods for which some worthy dame has just exchanged her last week's churning. In the doorway, leaning against the side, and divested of coat and hat, stands the village merchant, while, deepening the notches in the bench or tilting on the chairs, the village loungers while away the sleepy hours. They smoke and chew, and chat and laugh, talk of the news, the latest foal, or the price of corn — good fellows, whom we all like, and whose opinions upon stock-raising and planting are by no means to be lightly estimated. Now and then they slap a well-dressed comrade on the back and familiarly call him "Doc." He is in high favor at the store, a sort of chairman of the gathering. Have you ever seen this picture? Be careful how you make a constant figure in it. You will go there with an eye to business, and will teach yourselves to believe that with the people "good fellow" means "good doctor" also. Guard against such a course and such fancies, however much you may desire to increase your practice. It is easy enough to stop as you pass for a momentary exchange of good-will, without becoming a stereotyped member of that little party; and, believe me, the country people, like those in cities, take most pride in a doctor who from his refinement and superior education can find little pleasure in such idle associations. He is expected to be the first man of his neighborhood, and the higher and broader his culture the more is he reverenced, beloved, and sought after, provided always that the true gentleman is there as well as the scholar. Another picture hardly less objectionable could be drawn by transferring the scene and the actors to the doctor's office. I have known such places that looked more like the card-room of a corner saloon than the habitation of science and culture, and I urge you to discountenance, from the start, idling in your sanctum. This can be done by you without giving offense, and if commenced early may be accomplished easily. Let me remark here in passing that a well-furnished, well-kept office, one that has an atmosphere of studiousness and cleanliness pervading it, will go far as a legitimate means for increasing your practice. A doctor's office should be something more than a barren room, with a bare floor, few chairs, deal tables, and dusty slate. Like the dress of woman, it is a gauge of one's taste and culture, and when neat and cozy will exert a sanitary influence upon both the possessor and his patrons.

HAY FEVER.

Thomas C. Hoover, M. D., of Bellair, Ohio, writes to the *American Journal of Medical Science* as follows: —

"Miss M. E., who had been suffering from recurring attacks of catarrhus æstivus for eleven years, consulted me as to what means she should try for relief. The disease had uniformly recurred on the 18th of August, and had a mean duration of six weeks. At the time I first saw her she was in a paroxysm of sneezing, which she said had lasted for several hours. At times she suffered from distressing dyspnœa. She had also a slight cough; general health excellent. Made a solution as follows: Potassæ chloratis, gr. xx.; morphiæ sulphatis, gr. iv.; aquæ distillat., fl. ʒ ij. M.; and used it by means of Holmes's atomizer, it being the most convenient. The relief was instantaneous. The same application was continued. The patient slept well, and was apparently entirely relieved until the fifth day. The sneezing returned. I then ordered her to use through the same instrument the following: Potassii bromid., ʒ j.; aquæ, fl. ʒ ij. M. The paroxysm was interrupted as in the first instance. I ordered her to use these solutions alternately, using from six to ten inhalations three times daily, or equal to about one fourth of a drachm of the mixture. She continued to improve under this treatment, and without another return of dyspnœa or sneezing, until the 15th of September, when she discarded the use of the spray, being entirely well.

"J. D., a married man, aged about twenty-five years, who had been a sufferer from the same disease for six years past, came to my office, on the 26th of August, in the midst of a violent paroxysm of dyspnœa and coughing. He complained of a sensation of weight over the region of the bifurcation of the trachea, and a smarting sensation there when he coughed. Having the first solution on the table, I directed him how to use it. The relief was the same as in the first case. Ordered him to continue the use of the spray. Saw him about the 12th of September. He had discontinued the inhalation, having been entirely free from any symptoms of the disease after the first week he had used my treatment.

"Two other cases which came under my care were treated in the same way and with the same success."

Many popular "opium antidotes" prove to be simply preparations of morphia.

CHLORALIANA.

Hydrate of Chloral in Hooping Cough. — Dr. James Bordley, of Centreville, Ohio, in the *American Practitioner*, commends chloral hydrate in hooping cough. The dose, of course, must be regulated by the age of the patient and the severity of the attack, and care always taken to observe the peculiar susceptibility in each individual case; as some children are much more susceptible to its action than others, as much so as is the case with opium and its preparations. He commences with a half grain for a child one year old, and increases half a grain for each additional year, and repeats every three or four hours. After noting the effect of that dose, he increases it from a half to one grain each day, according to the severity of the attack and the peculiar tolerance of the medicine. Yet in some cases this plan may be deviated from with benefit, and the increase may be much greater and more rapid, but in the majority of cases he has found the above plan satisfactory. Watch the effect of the article, and when decided symptoms of hypnosis are manifested suspend its use until the subsidence of such symptoms, then begin it again in diminished quantity, to be increased as before. The "compound syrup of sarsaparilla" is a good vehicle for its administration, as it masks the taste and destroys the pungency of the chloral effectually.

Chloral as a Preservative Agent. — We may add to what we have formerly said on this subject, that M. Cuvellier lately exhibited to the Société de Biologie, in Paris, the carcass of a dog which, after fifty-five days, exhibited no trace of putrefaction, although it had been kept in a laboratory in which there was a fire. The dog had been injected by the carotid with a solution of 100 grammes of chloral in a litre of water. The brain, placed in the same mixture, was also well preserved, so that it could be easily demonstrated, not having undergone the slightest appreciable alteration.

Chloral Hydrate and Camphor as a Local Application in Neuralgia. — It is said that the intimate mixture of equal parts of chloral hydrate and camphor will produce a clear fluid which is of the greatest value as a local application in neuralgia. Mr. Lenox Browne states, in the *British Medical Journal*, that he has employed it, and induced professional friends to do so, and that in every case it afforded great, and in some instantaneous relief. "Its success does not appear," he says, "to be at all dependent on the nerve affected, it being equally efficacious in neuralgia of the sciatica as of the trigeminus. I have found it of the greatest service in neuralgia of the larynx, and in relieving spasmodic cough of a nervous or hysterical character." It is only necessary to paint the mixture lightly over the painful part, and to allow it to dry. It never blisters, though it may occasion a tingling sensation of the skin. He has found it also an excellent application for toothache.

NOTES FROM ABROAD.

Hypodermic Injection of Carbolic Acid in Erysipelas. — Dr. Aufrecht, of Magdeburg, having last year lost four patients of advanced age who were attacked by erysipelas of the extremities after injury, determined to try the effect of carbolic acid, and communicates to the *Centralblatt* the results which he obtained in two cases. He reasoned that if it be true that erysipelas in such cases as these arises from the penetration of organisms into the subcutaneous tissue, and their multiplication there, and if carbolic acid possess the power of destroying such organisms or of impeding their injurious influence, this substance should be able to prevent the spreading of the erysipelas, and to a certain extent diminish its danger. In order to ascertain whether carbolic acid may be hypodermically employed with-

out any ill consequence, he experimented upon himself with a one per cent. solution, of which he threw in six decigrammes at a time. Neither local nor general ill-effect resulted. Since then he has employed the injection in two cases — the one a woman aged fifty-six, with erysipelas of the forearm and the hand, arising from a slight abrasion; and the other a man, aged eighty-two, with erysipelas of the thigh, following slight ulceration of a cicatrix. In the first case five injections were employed during three successive days, and in the second four injections within two days. The injections were thrown into the sound subcutaneous tissue just beyond the margin of the erysipelas as it advanced towards the trunk. Its progress was at once arrested in the direction where the injections were made, the injection being repeated in consequence of some insular erysipelas appearing beyond the first injection-points. More remarkable still than this limitation of the erysipelas was the decided influence of the injections in diminishing the febrile action and the frequency of the pulse, and in inducing a general improvement in the patients' condition. Convalescence was quite satisfactory in both patients.

New Substance from Morphia. — A new substance has been prepared by Nadler by the action of an ammoniacal solution of cupric oxide on morphia. Its chloride is of a brilliant white color, and is easily soluble in hot water, in which the ammonia throws down an amorphous precipitate, that remains unchanged in the air in the moist state. With concentrated sulphuric acid it becomes of an intensely green color. From the potash solution, when boiled, the alkaloid separates in scales, having the lustre of silver. It is, moreover, distinguished from morphia by the trifling solubility of its sulphate, and from apomorphia by its stability in moist air.

A Medical Monkey. — An Oriental correspondent of an English journal relates this story, which he obtained from trustworthy sources: "The original teller of the tale was formerly barber of the village of Katluh, near Chilkanah. He one day saw a monkey holding a snake by the throat and rubbing his nose in the dirt; the snake did not die immediately from this punishment, as the ground was wet, but it coiled itself round the body of the monkey, who every now and then looked most knowingly in its face to see if it was dead. The monkey at last, in the course of his investigations, put his own face too near that of the party examined, who repaid him with a bite. On this the monkey set to with redoubled zeal and killed the snake dead; but hardly was the snake dead and its coils relaxed, before the monkey fell down, to all appearance dying. An old monkey immediately came up, and examining the body of his fallen companion, gave him a pretty smart kick, and discovering signs of life immediately went off to some bushes, followed by the barber, who suspected his intentions. He there collected some leaves, of which he made a bolus, *secundum artem*, went back and administered it to his snake-bitten friend, who shortly after revived, and walked off with his medical attendant." The plant used by the monkey doctor was what is known as the "red chirchita." There is also a white chirchita, but this, according to the barber, would have been of no use.

Antidote for Prussic Acid. — On this subject Mr. J. W. Walker, in the *English Mechanic*, says: An iron mixture is the recognized antidote to prussic acid, and when practicable should always be given; but there are two serious objections to its unaided use. First, it takes time to mix; not more than a minute or so, certainly, but the delay is often enough to prove fatal: and, secondly, there is the utmost difficulty in getting anything into the mouth of a person poisoned by prussic acid. I believe the best remedy is cold water copiously applied to the back of the spine. Let the patient be immediately put under the pump, and let his neck and backbone be deluged with water for a quarter of an hour if necessary. I know of two cases where this plan has proved effectual — one was a man, the other a cat. In the latter case water was not resorted to till the animal had ceased to struggle from the effects of the poison, and several persons had pronounced it dead.

Oatmeal as Food for Infants. — We have several times referred to the value of oatmeal as an article of food, and we see by a recent article in a French medical journal, that it is now commended by Dujardin-Beaumetz and others as a diet for infants. They claim that it is the aliment which, in its plastic and respiratory elements, makes the nearest approach to human milk. It is also one of those which contains most iron and salts, and especially the phosphate of lime so necessary for infants. It also has the property of preventing and arresting the diarrhœas which are so frequent and so dangerous at this age. According to the trials made by M. Marie, infants from four to eleven months of age fed exclusively upon Scotch oatmeal and cow's milk thrive very nearly as well as children of the same age suckled by a good nurse.

Picric Acid in Lager Beer. — Some of the German brewers have found that picric acid is a cheap substitute for the wholesome bitter of the hop, and are making the poisonous picrate of ammonia do duty for lupulin. Whether the trick has been tried in this country we do not know, but it is well to state a means of detecting it which Pohl has discovered. Unbleached sheep's wool is steeped for a few minutes in the suspected beverage, and assumes a canary-yellow color if picric acid be present.

Glazier's Putty as a Surgical Dressing. — According to the *Medical Press and Circular*, ordinary mixed putty has been found by Mr. Courvall to be the softest and most applicable means of treating excrescences or tumors of various kinds where compression is desired, as it moulds itself so neatly to the skin. He believes it to be superior to dextrine, silicate of soda, or plaster bandages. It is a cheap and always attainable material.

Poisoned at a Chemical Lecture. — A very tragic occurrence took place recently at Bucharest. Dr. Bernath, the principal of a public laboratory in that city, was giving a popular lecture on chemistry. Among his hearers was a Madame Davila, a lady of good family and intimately acquainted with the professor. The lady was taken ill in the course of the lecture, and the doctor prepared a draught for her in which he intended to mix some quinine, but by accident used strychnine instead. The unfortunate victim was taken out into the street, and died almost instantly.

FORMULÆ FOR PILLS.

The following formulæ, furnished by Mr. Proctor in his recent work on "Practical Pharmacy," are specially selected for approval by his reviewer in the London *Chemist and Druggist*: —

Creosote Pills.

Creosote	gtt. xxiv.
Ft. pil. xij., with	
P. amygdal.	gr. xxx.
Glycerine	gtt. xij.

Camphor Pills.

Camphor	ʒj.
Ft. pil. xij., with	
Ol. ricini	gtt. iv.
P. sapon.	gr. ij.

Rub the camphor to a powder with the oil, and work into a mass with the addition of the soap.

Carbolic Acid Pills.

Acid carbolic	gr. iij.
Ft. pil. j. Mitte xlviij.	

"144 grains of purest carbolic acid and 24 grains of yellow wax were melted together in a test-tube, poured into a cold mortar, and rubbed into a rather adhesive powder; soft soap was then added by small degrees till 8 grains had been added, when it was found that the whole could be worked into a mass and divided into pills."

Chloral Hydrate Pills.

Chloral hydrat.	gr. lx.
Pulv. tragacanth.	gr. iij.
Soluble cream of tartar	gr. xij.

Mix, and divide into twenty pills.

Calcined magnesia seems to be the best excipient for balsam of copaiva and Chio turpentine; treacle, for iron compounds, and syrup. aurantii for Pil. Rhei Comp.

MEMORANDA AND RECIPES.

Acute and Subacute Rheumatism. — The leading feature in the treatment of these cases in the Roosevelt Hospital, consists in the administration of iodide of potassium in doses varying from 8 to 15 grains, combined with 15 drops of the wine of colchicum-seeds, three times a day. To relieve the local pain about the joints, the application of ice in ice-bags has proven most satisfactory. When the acute symptoms have been subdued, or have subsided, the application of kerosene oil to the stiffened joints, accompanied with free rubbing of the parts, has afforded more relief than other applications. Whether the virtue is in the oil, or in the rubbing, or in both, can hardly be stated, but the beneficial results which have been derived from its use warrant its adoption.

Tamarind Cough Elixir. — The London *Chemist and Druggist* gives this formula in reply to the question of a correspondent: —

Boil gently half a pound of West Indian tamarinds in a pint of distilled water for half an hour. Cool and strain, make up with more distilled water to the bulk of a pint, and add: —

Acet. scillæ	ʒx.
Acid. acet. dil.	ʒiv.
Tinct. camph. co.	
Æther. chlor.	āā. ʒijss. M.

A teaspoonful for a dose.

Lotion for Fetid Feet. — *L'Union Médicale* gives this recipe: Permanganate of potash fifteen parts, distilled water 1000 parts. The feet to be washed twice a day with the lotion. They are then to be carefully dried, and powdered either with potato-starch or lycopodium.

Treatment of Burns. — The *New York Medical Record* states that at the Roosevelt Hospital white-lead paint has been found, after trying almost every plan of treatment hitherto proposed, to be the best and cleanest application. Mix as for painting, but considerably thicker, and apply with a brush. A very neat and satisfactory dressing in superficial burns consists in coating the surface with mucilage, and then covering it with powdered lycopodium.

Cincho-Quinine. — The following are a few out of many testimonials to the value of this agent, that have been recently received by Messrs. Billings, Clapp, & Co.: —

I think it (Cincho-Quinine) answers as well, if not better, than the sulphate of quinine. I have used it in fever and ague with good results.

F. Foster, M. D.,
Sandy Hill, Washington County, N. Y.

I was very much pleased with the therapeutical action of the Cincho-Quinine you sent me.

I. Lewis Dorset, Genito, Va.

I have been using the Cincho-Quinine in my practice ever since it was first introduced, and am so well pleased with it that I use it now altogether.

H. C. Stewart, M. D., Bloomingburgh, Ohio.

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Familiar Science.

PHOSPHORESCENCE.

IT is related of Christiana, the daughter of Linnæus, that while watering some favorite plants in her father's garden in the evening of a hot summer's day, her attention was arrested by flashes of light emitted by the blossoms of the nasturtium. Other observers have noticed the same phenomenon in connection with the same plant, and Coleridge thus alludes to it: —

"'Tis said on summer's evening hour
Flashes the golden-colored flower
A fair electric flame."

Though some naturalists have maintained that this emission of light by flowers is to be explained as a mere optical illusion, it seems to us that the evidence in its favor is too strong to be set aside. A writer in *The Garden*, of London, gives the following account of an instance of the kind, which he appears to have observed very carefully: —

"On the evening of the 12th of June last, at 8.40, I was looking at a bed of scarlet geraniums in bloom in the front of a small vinery facing southwest, when I was startled by seeing distinct flashes of light flitting to and fro horizontally, and in a line with the flowers of a short row of a deep scarlet kind of geranium, similar in general appearance to the old Tom Thumb. I at first doubted my visual organs, but on calling the attention of a gentleman who was near the flowers, he at once corroborated my previous observations; we remained about five minutes observing it, during which time the light was intermittent but at intervals of only a few seconds. I think the appearance of the light extending through the row was caused by all the flowers of the row emitting small flashes at one and the same time. . . . I have only on one subsequent occasion seen the same phenomenon, and then on a much smaller scale."

We have never before seen the geranium recorded among these luminiferous flowers. The phenomenon has been observed in the marigold, certain yellow lilies, the poppy, and perhaps a few other phanerogamic plants besides the nasturtium. In cryptogamic plants it would appear to be less rare, having been noticed in several species of *Agaricus* and other Fungi. The *Rhizomorpha subterranea*, which is found on the walls of damp mines and caverns, is said sometimes to give out sufficient light to enable one to read ordinary print by its aid. The phosphoric light of decayed wood is also due to a species of fungus; and other cases of the emission of light by decaying vegetable matter are probably to be explained in a similar way. According to Dr. Phipson, the light thus given out by a cellarful of potatoes in Strasburg was so strong as to lead an officer on guard to believe that the barracks were on fire.

It is well known also that many animals have this light-giving power. The glow-worm of England, which is really a beetle, and the fire-fly of our own country, which is likewise a beetle (or, rather, several different species of beetle), are familiar examples. The luminosity of the sea is caused by minute animals, belonging to several widely different species. Those of our readers who have made a sea voyage, or even taken an evening sail in the harbor, have doubtless seen the wake of the vessel aglow with the mingled radiance of myriads of these little creatures. In crossing the Atlantic, the steamer sometimes strikes a place where they are so abundant that she seems for hours to be ploughing through a sea of lambent flame. At other times, when the water is less crowded with them, their scattered and fitful flashing makes the ocean appear like the reflection of a meteoric shower.

Among the lower orders of animals there are very many in which this luminosity is manifested, though in varying degrees, but it is extremely rare in vertebrate animals — at least, while they are alive. Everybody knows that certain kinds of dead fish shine in the dark, and there are some cases on record in which butcher's meat has exhibited a like appearance. It is said that phosphorescent light is sometimes observed at night on corpses in a dissecting-room. It is also stated on undoubted authority that in a few instances the human body shortly before death has become faintly luminous, and there is good evidence that a similar phenomenon has occurred in the case of persons in ordinary health. Bertholin, in his treatise *De Luce Hominum et Brutorum*, published in 1647, gives an account of an Italian lady — "mulier splendens" he appropriately calls her — whose body shone with phosphoric radiations when gently rubbed with linen. Dr. Kane, in his last voyage to the polar regions, witnessed a case of human phosphorescence scarcely less remarkable.

There are also luminous minerals, like fluor spar, which, if gently warmed over a flame and then taken into a dark room, shines for some time with a pale blue light. Other substances become luminous by mere concussion, friction, or fracture. Crystals of nitrate of uranium, shaken up in a bottle, are beautifully brilliant in the dark. Break a lump of loaf sugar, or rub together two lumps of the substance, in a dark room, and you will see flashes of light. Hard sugar candy, or common "lozenges," will answer well for the experiment. Crunch them between the teeth in the dark, and your mouth will seem all on fire.

There are yet other bodies that, after being merely exposed to the light, are luminous for some time after being removed to a dark place. This is the case with diamonds, especially those of a yellow tint, and many substances known to chemists, like the sulphides of barium, strontium, and calcium. Indeed, the researches of Becquerel, Draper, Phipson, and others, show that this is a phenomenon common to a great variety of substances, though in most of them to only a very slight degree. Even the human hand, if exposed to sunlight for some time, and then suddenly withdrawn into a dark room, will be faintly visible for a moment or two.

All these phenomena, and countless others of a similar character, are generally grouped under the common title of *phosphorescence*, a term obviously enough derived from *phosphorus*, which glows in atmospheric air with a pale lambent light resembling that emitted by most of the bodies we have mentioned; but though alike in the effect produced, they are by no means to be ascribed to a uniform cause. The light of insects and other animals is in some cases the result of a true combustion, though its nature is imperfectly understood. It was long supposed that it was really an oxidation of phosphorus, but the researches of Matteucci render it probable, to say the least, that it is carbon, and not phosphorus, that feeds these mysterious fires — fires in which no *heat* has yet been detected, but doubtless only because we have no instruments delicate enough for the purpose. In other cases these animal lights appear to be due to vital action, like electricity and nerve force. In plants also the luminosity may be produced in both these ways. In decaying organic substances the light generally arises from slow combustion, but, as it sometimes appears in substances that contain no phosphorus, it is not always, and perhaps it is rarely or never, due to the oxidation of that element. In mineral bodies the luminosity is to be explained as the result of some molecular motion or change caused by the exposure to light or heat, or the agitation to which they have been exposed. It is only to this last class of phenomena that the term *phosphorescence* is strictly applicable.

Phosphorescence, in this limited sense, has been the subject of extended and careful investigations, of which our limits forbid us to give even an outline at this time. Suffice it to say that though they have led to many curious and interesting discoveries, they have not fully solved the problems which the subject involves. These evanescent mysterious forms of light still baffle the philosopher who would penetrate to the source of their pale, faint fires, which our eyes can discern indeed, but which do not affect the most delicate thermometer or the most sensitive photographic film.

THE GOBLIN METAL.

COBALT may be called the goblin metal, for its name is identical with the old German *kobold*, which is the same as the Latin *cobalus* (Greek, κόβαλος), and the word *goblin*, which has the same meaning, has precisely the same etymology. To understand how the metal came to have such a diabolical appellation we have only to trace back its history to the time of its discovery in the sixteenth century.

The mining districts of Saxony are famous for their mineral riches, and equally so for the hosts

of spirits, gnomes, and kobolds, which are still reputed to watch over the concealed treasures of the neighborhood. These presiding genii had long rewarded the miner's toil with rich ores of silver, copper, and lead; but at length, with a caprice not uncommon to their nature, they withheld these valuable gifts, and he brought up little else than a despised ore, which yielded nothing to the smelter but a reddish-brown powder, while it injured his health by its arsenical fumes. The rich ores had been changed into rubbish by the kobolds, or goblins of the mine, and the poor miners on this account sought and obtained the intercessions of the Church, which from that time included in her services a petition for deliverance "from all kobolds and spirits which injure the miner."

But in this case, as in many others, the answer to prayer was given in a manner wholly unexpected by the petitioners. The poor miners of Schneeberg, who had suffered most from this transmutation of their rich ores into "ball cobalt" (as they called the mineral, after the base fiend who had wrought the mischief), were destined to be relieved from their perplexity, and to see the despised substance become a source of wealth far greater than the ores whose deterioration they deplored.

One Christopher Schurer, a glass-maker of Neudeck, first collected some of this Schneeberg ore, and tried it in his glass furnace, when he found to his delight that it communicated to glass a beautiful blue color. This was about the year 1540, or perhaps earlier. Schurer made many trials of the new material, and at length succeeded in making of this blue glass an enamel color well adapted to the use of the potter. This color found its way to Nuremberg, and at length to Holland, where it was highly appreciated by the Dutch artists. They sought out the humble glass-maker of Neudeck, and tempted him by large promises to reveal his secret. He took up his residence for a time in Magdeburg, and had the ores of Schneeberg conveyed thither for the purposes of his manufacture. But he afterwards returned to Neudeck and constructed a handmill for grinding his glass to powder, and afterwards another which was driven by water. Meanwhile the Dutch had become expert in the preparation of the color, so that they obtained from 100 to 120 shillings per cwt. for it, while the price in Saxony was only about one-fifth as much. At a later period, therefore, the Elector of Saxony had to invite the color-makers of Holland to teach their methods to his people; after which color-mills rapidly increased in the neighborhood of the cobalt mines. Thus for a very long period this beautiful color continued to be manufactured from a mineral whose composition was unknown. It was not till the year 1733 that the Swedish chemist, Brandt, obtained from that ore the metal which he called cobalt, and proved that the coloring matter is the protoxide.

Of the history of the metal since its isolation by Brandt, it is not our purpose to speak. The protoxide still retains its early importance as a means of coloring glass, and several new and beautiful compounds used for similar purposes have been discovered in our own day; but the metal itself, in its uncombined form, is merely a chemical curiosity. It resembles iron in many of its properties, and is superior to that metal in tenacity, but the difficulty of extracting it from its ores has thus far prevented its use in the arts. In that respect, at least, it still remains a goblin metal.

CYANOGEN.

THERE are substances whose names are rarely heard outside the chemical lecture-room or laboratory, but which nevertheless are important ingredients in many compounds that are as familiar as household words. The name which stands at the head of this brief article may serve as an example. Who talks about cyanogen? How many out of a hundred people to whom you might put the question could tell you what it is or where it is to be found? Oxygen, nitrogen, and hydrogen are things of which many people have some general knowledge, though they have never read an elementary book on chemistry; but cyanogen, a word which evidently belongs to the same etymological family of scientific terms, is "all Greek" to them. Greek indeed it is in its origin, meaning blue-maker, as oxygen means acid-maker and hydrogen water-maker. It *is* a blue-maker, and until the aniline colors came into vogue, the so-called Prussian-blue, into whose composition it enters, was the most important of blue dyes, and is still largely used. But cyanogen does not merely appeal to the eye; in other of its compounds it addresses the senses of taste and smell. The ripe cherries which many of our readers are doubtless enjoying at the moment when we write, owe their exquisite flavor to prussic acid, which is a compound of cyanogen and hydrogen; and the same is true of the peaches and plums that will tickle our palates with their delicious juices later in the season. The violet and heliotrope derive their fragrance from the same substance in another of its combinations. In its concentrated state, as everybody knows, this prussic acid is one of the most swift and deadly of poisons, while in a very dilute form it is a valuable medicinal agent.

Cyanogen has contributed also to the celebration of the "Fourth of July" just passed, and to the more serious business of war which the noisy demonstrations of that anniversary bring to mind. The fulminate of mercury, to which percussion-caps and various forms of torpedoes and "crackers" owe their detonating quality, is a compound of cyanogen. Gunpowder is a mild and sluggish explosive compared with this fulminate, a single pound of which suffices for twenty or twenty-five thousand percussion-caps, according to their size. But there are other fulminates which bear much the same relation to this mercurial one that this does to gunpowder — the fulminate of silver, for instance, which in a dry state will scarcely bear the lightest touch of any hard substance without exploding violently, and the double fulminate of silver and ammonia, which is yet more prone to detonation, and dangerous even while moist.

This cyanogen, which forms all these remarkable compounds, and others of great chemical and industrial importance to which we have not alluded, is not an elementary substance, like oxygen, hydrogen, and nitrogen, but a compound of carbon and nitrogen. At the same time it is singularly like an element in some of its chemical relations, and has therefore been honored with a "symbol" (Cy) such as is given to elements, though it is also represented by the formula CN, which indicates its composition. In its free state, it is a colorless inflammable gas, of no practical use whatever, though its compounds are so varied and so valuable.

ELECTROTYPING FROM NATURE.

THE process of obtaining electrotype fac-simile copies of natural objects is by no means so difficult as might be imagined, the manipulations requiring only ordinary skill and attention, and the materials and apparatus being simple and inexpensive. The electrotypes are valuable for scientific purposes, especially in museums, and if tastefully grouped they may form beautiful ornaments for household decoration.

A mould is first taken by brushing hot melted wax with a camel's-hair pencil over the object to be copied, leaving the under side untouched. As soon as this wax coat has been made thick enough to bear handling, and is cold or cooling, the object should be drawn away from beneath. If a leaf, it may be best withdrawn while the wax is still warm; if a coiled snake, the wax should be cold, and then the reptile may be easily withdrawn through the space left beneath it, as it lay on the modelling board.

The mould should then be thoroughly brushed with plumbago or black-lead, laid on as a fine powder with a strong camel's-hair pencil, or any brush that will serve to get the black-lead into the minutest folds, and give a perfect mirror-like polish to the surface. The quantity of black-lead that adheres to the mould is not important, but on the perfection of the polish depends the whole beauty and success of the electrotype. A stout copper wire should be fixed (by just warming and pressing it) on the back of the wax mould, and black-lead well polished on to the surface, from the copper wire to the surface to be coated.

For depositing the copper, a single battery-cell is best. A common white glazed jam-pot answers every purpose, taking whatever size may be required. This pot should be three-quarters filled with a saturated solution of sulphate of copper. In the sulphate of copper should be placed at one side of the jam-pot a porous cell, three-quarters full of very dilute sulphuric acid — at the very strongest with not more than one part of acid to thirty of water. In this dilute acid a small plate of amalgamated zinc should be hung with a binding-screw on the top of it.

Before placing the polished mould in the depositing jar, the surface should have a little alcohol run over it, to remove both the film of air and any adhering particles of plumbago; the wire should be bent at a right angle a little above the mould, and the extremity should be passed through the hole in the binding-screw, and fixed firmly in it; and the mould being pressed well beneath the surface of the solution, by any careful bending of the wire that may be requisite, and its face turned towards the zinc, deposition of copper should instantaneously begin.

If things have been properly managed, the film of copper will spread rapidly over the black-leaded surface from the copper wire, and will gradually thicken till it is fit to be removed as the completed electrotype from the solution. Being then cleared from its mould either by having the wax cracked from it, or, in case of much undercutting, scalded away, it will appear as a copper fac-simile of the original object, only requiring to be neatly trimmed with a file and

to have its surface bronzed before taking its place wherever may be desired.

During deposition the loss of the copper in the solution must be supplied by hanging little bags of the sulphate of copper crystals in the solution. The zinc in the cell should be taken out and brushed clean once a day, and the dilute acid in the cell should also be replaced once a day. Otherwise little attention is needed beyond looking occasionally to see that the copper growth is proceeding favorably. This may be known by its bright and smooth appearance; if the copper should appear of a hot red tint and sandy texture, the deposition is too rapid. This may arise from the use of too large a zinc surface (as a general rule, it should not be much larger than the mould to be coated), too strong acid, or too short a connecting wire; or, again, the sulphate solution may have been too weak, or the solutions overwarm from the weather or some other cause, and the knowledge of the cause will at once suggest the remedy. No directions can supersede watchfulness and thought on the part of the operator.

The only real difficulty in the process is where there is much undercutting, for the current of electricity does not deposit as freely on surfaces removed from the zinc as on those exactly facing; it is, therefore, necessary to be certain that these are thoroughly well polished before placing the mould in the depositing jar. If spots should be found uncovered by the copper, the incomplete electrotype may be raised from the solution, washed gently, dried, repolished with plumbago on the bare places, and then put back into the solution.

For joining detached electrotypes into groups it is only requisite to fix them firmly together by means of hot wax, being certain to protect all surfaces that are to be seen in the completed group by a good coating of wax. The mass may then be treated as a common electrotype — the wax which may appear between the copper surfaces at the back of the group well polished, and the exposed copper surfaces made thoroughly clean, and washed with spirit just before placing the mould in the depositing jar. The copper will spread alike over wax and bright copper, and will form the detached pieces, by "galvanic soldering," into one firm piece. For bronzing, use a mixture of sal ammoniac and verdigris dissolved in vinegar. If the electrotype is allowed to stand for a while in this, and then taken out and washed, a good tint may be obtained; if the first steeping is not enough, repetitions of the process will deepen the tint.

THE PHILOSOPHER AND HIS NIECE.

Faraday was remarkable for his great love for children. All his biographers notice this trait in his character, and it is said to have shone out conspicuously in his juvenile lectures at the Royal Institution. The *Argonaut* for June prints the following letter, addressed to one of his nieces, then five years of age: —

"Royal Institution, 19*th May*, 1852.

"My dear Constance, — First a kiss, p— p— p— ph; next, thank you for your good letter — very well written, and very pleasant; and now thanks for the letter you are going to write to me, in which you must tell me how Papa and Mamma do, and what you are about.

"I went this morning to see a fish like a great eel take his breakfast. This morning he had three frogs for breakfast; yesterday he ate nine fish in the course of the day, each as large as a sprat, and the day before fourteen. When the fish are put into the water he electrifies and kills them, and then swallows them up; and if a man happens to have his hands in the water at the same time, the fish — that is, the eel— electrifies the man too. The eel is now about twelve years old, and is heavier, I think, than you are.

"Yesterday, I saw the Royal children, the Prince of Wales and the Duke of York — such nice children! they would make famous playmates for you; but I do not know whether princes do play much. I do not think they can be as happy in their play as you are.

"As to the 'Magnic,' when you and I meet we will have a long talk about it, and make some experiments. And so, with my love to Papa and Mamma, and curious Constance, with a kiss for each, I am your loving old uncle,

"M. Faraday."

FRENCH SCIENTIFIC NOTES.

New Electro-Chemical Theories. — At a recent meeting of the French Academy, M. Martin maintained that, in the decomposition of water by a current or any similar electro-chemical action: 1. The two electricities are not forces, but imponderable substances, having strong and different chemical affinities, and they exert on the elements of water a double chemical action, which transforms them into gases. 2. Water does not contain, as is usually supposed, two gases condensed, which we have merely to dissociate in order to reproduce. 3. The two gases whose combination produces water are compound bodies formed by the chemical union of oxygen, a simple body, to positive electricity, and by the union of simple hydrogen to negative electricity; the combination of these gases giving two binary substances, water and caloric. 4. The currents of the pile do not traverse the acidulated liquids of the voltameter, and do not effect the transport of elements, but the two electricities simply arrive at the electrodes and there unite with the elements of water, transforming them into hydrogen gas at the negative pole and oxygen at the positive. M. Martin gives names to the electricities; distinguishing negative electricity as *electrile*, with symbol El, and positive electricity as *etherile*, with symbol Et.

Waterspouts. — It has been assumed that the whirling column of air that produces a waterspout is an ascending one, but M. Faye, the astronomer, has endeavored to prove to the French Academy that it is a descending column. Precisely as in a river vertical layers of water, moving with different velocities, form whirlpools in shape like funnels, drawing the water away from the centre, so, when currents of air above the clouds move in different directions, or in the same direction with different velocities, they produce upon their borders a gyratory motion of the interposed air. This air descends like the water in the whirlpool, and if the gyratory movement be powerful enough the tube of rotating air may reach the earth. At the same time the centrifugal force determines the matter to the exterior, and causes a partial vacuum in the interior, thus explaining the lifting of objects over which the whirlwind passes, and in the case of water producing waterspouts. Of course the barometer in the centre experiences a sudden fall. The solar spots Faye explains in this way, supposing them to be whirlwinds seen vertically. The solar gas drawn into them being cooler, appears as the dark umbra.

Chemical Force of Sunlight. — E. Marchand has devised a method of determining the chemical force contained in sunlight. The agent used to determine the chemical power of the sunlight is a mixture of solutions of oxalic acid and ferric chloride. The solutions are saturated with carbonic acid gas. Under the influence of sunlight the oxalic acid is decomposed, carbonic acid is evolved, and a ferrous salt is formed. By collecting and measuring the carbonic acid gas over glycerine, the intensity of the effect of the sunlight was accurately measured.

A Remarkable Ingot. — General Morin lately exhibited to the French Academy an ingot of 250 kilogrammes (about 550 pounds) of an alloy of platinum and iridium, made for the International Metric Commission. The iridium was prepared by H. Sainte-Claire Deville, but the task was a dangerous as well as a difficult one, as the metal is found mixed with osmium, and the vapors of osmic acid are exceedingly poisonous. M. Deville remarked that with the 8 kilogrammes (about 17 pounds) of osmium which he separated from the iridium he could poison the entire population of the globe. A single milligramme (.015 grain) is sufficient to render dangerous the atmosphere of a room of the capacity of 100 cubic metres (3531 cubic feet).

HINTS FOR EXPERIMENTS.

Simple and Cheap Glass Cells. — Mr. F. Clowes, of Queenwood College, Hants, sends to *Nature* the following description of a method for extemporizing glass cells with parallel sides: "A piece of india-rubber tubing (or solid rubber) bent into a semicircular form is placed between two equal-sized rectangular plates of glass, the ends of the tube terminating at the upper edges of the glass plates: the plates are then held together by passing two strong india-rubber rings over their ends. If the rings are of such a size as to exert the requisite compression a semicircular water-tight cell is thus obtained, which can be taken to pieces and cleansed with great ease. A trough so made served well to exhibit with an ordinary magic-lantern the experiments described on pp. 173 and 174 of Tyndall's 'Heat a Mode of Motion,' and smaller cells suitably fitted with platinum wires, and held in the wooden frame of an ordinary lantern-side, enabled the galvanic decomposition of acidulated water and of saline solution to be thrown upon a screen and thus rendered visible to a large audience."

To Illustrate the Oxidizing Power of Charcoal. — Professor Hofmann states that when a freshly prepared solution of leuk-aniline is dissolved in alcohol, the solution is colorless and remains so for a long time. If, however, a small quantity of finely divided animal charcoal, such as is daily employed for decolorizing solutions, be thrown into the solution and then boiled for a few minutes and filtered, it will be found that the solution has acquired a deep carmine-red color. The oxygen condensed in the pores of the charcoal has converted a considerable quantity of leuk-aniline into rose-aniline.

A Home-Made Barometer. — What is known as Babinet's baroscope is a simple and convenient instrument for foretelling a storm by change of atmospheric pressure. To construct it, take any bottle, and pour colored water into it to one fourth its depth; insert in it a glass tube, from three to four feet long and passing air-tight through the stopper, which must also be air-tight. Let a paper index, divided according to any scale of division, say into inches and fractions of an inch, be glued to the glass tube. Blow into the glass tube, so as to cause the water to rise in it a few inches, say ten inches, and the instrument is constructed. The bottle must be placed in another vessel, and protected by sawdust, or some other material, from the influence of change in the temperature of the atmosphere. This very sensible instrument records faithfully any changes in the density of the external air, and the approach of a storm will be indicated by a sudden rise of the water in the glass tube.

Practical Chemistry and the Arts.

BESSEMER STEEL.

BY S. P. SHARPLES, STATE ASSAYER.

With the rapid growth of railroads and the great increase in weight of engines and trains has come a demand for better rails. The old iron rail, made by piling bars of iron upon each other and then raising them to a welding heat and rolling the white hot mass, will last for many years with ordinary traffic. But under the tread of heavy locomotives and endless trains of freight cars it soon becomes laminated and worthless.

Steel heads were suggested for the rails, but it is very difficult to make a perfect weld between the steel and body of the rail, and rails made of cast steel were too expensive

At this juncture Bessemer invented the method known by his name for making steel. This may be briefly described as first removing all the carbon from cast iron by the action of a current of air upon the intensely heated metal, and then restoring a portion of it by the addition of an iron very rich in carbon. A mixture of iron and manganese, known as "spiegeleisen," from the fact that it crystallizes in large mirror-like crystals, is generally used; sometimes, however, the blast of air is stopped before the carbon is all consumed, thus rendering it unnecessary to add any further quantity of carbon. The whole process of the conversion of pig iron into steel is one of the most beautiful applications of modern engineering skill and chemical knowledge to the arts that I have ever witnessed.

During a recent visit to Bethlehem, Pennsylvania, I was afforded every opportunity of seeing the working of the process, by the gentlemanly superintendent, Mr. John Fritz. These furnaces are within three hours' ride of New York, and visitors can easily leave that city in the morning, visit the Iron Works, and return the same evening, though I think few will be willing to give Bethlehem so short a call, as there is much of interest to be seen there besides the iron and steel works.

The pig iron, as it comes from the blast furnaces, is put into the cupola furnace and run into a large iron ladle resting on trucks. When full, the ladle is run under the platform on which the converters are hung; it is then raised by hydraulic power until it is on a level with the mouth of the converter into which the iron is poured. These converters are huge egg-shaped vessels made of iron, and lined with fire-brick. The small end of the egg is open, and is so shaped that when the vessel is in a horizontal position the mouth opens directly upwards. The bottom of the vessel is provided with fire-brick tweers for the admission of air. The converter rests upon trunnions so that it can be completely inverted. One of these trunnions is hollow, and is connected with a pipe leading from the blast pumps and also with the tweers. Previous to pouring in the metal the vessel is heated by coal. When the metal has all run in, the blast is turned on and the converter is slowly raised to an upright position. When in this position the mouth faces an opening in the lower part of a chimney, which serves to conduct the products of combustion into the outer air. At first the flame issuing from the converter is of a reddish color, with some sparks of burning iron forming the well-known stars seen in fireworks. During this stage of the operation the silicon is converted into silica, and the iron combines with the graphitic carbon. The combustion of the silicon also produces an intense heat. The flame when examined with the spectroscope gives only a faint continuous spectrum. This in the course of four or five minutes commences to change; first the sodium line comes out, then bands begin to appear in the green and red, and finally the potassium line appears. The action is now at its most energetic stage; the noise of the boiling iron is almost deafening, and huge volumes of white flame pour from the mouth of the converter. This continues for some minutes, until finally the green and red bands disappear, showing that the carbon has all been consumed. The converter is turned again on its side and the spiegeleisen is poured in, when a fresh carbon flame appears for a few moments, and the steel is finished. The converter is tipped still further, and the steel runs into another ladle placed to receive it. This ladle rests upon a hydraulic crane and is slowly swung over the moulds. These are filled from the bottom, as that method makes a much better ingot than when the steel is poured in at the top of the mould. The moulds themselves are made of cast iron and are open at top and bottom.

As soon as the steel has set, the moulds are raised, and the ingot drops out. It is then loaded while still red-hot upon an iron car and taken to the reheating furnaces, which are built upon the Siemens plan, using gas instead of coal for fuel, the gas being made from coal outside of the building. When hot, they are removed and taken to the roughing rolls. Here they are managed entirely by machinery, two men controlling the huge ingot, which weighs over a ton, as readily as the blacksmith does a horseshoe. The train is three rolls high, so that no time is lost in returning the ingot; after running through the first rolls it is received upon a platform which can be raised by hydraulic power, and is returned through the upper pair; when through, it is again dropped, turned on its edge, and shifted to the next set of grooves, all by mechanical contrivances; and so on until it is finished. It is then received upon a car and taken to the steam hammer, where it is cut into three pieces, one ingot being sufficient to make three rails, each thirty feet long. It is returned again to the heating furnaces, and when heated passes to the rail rolls, which are also three high. After going through these, the ends are cut off by circular saws, the rails are straightened, holes bored through the web for the fish bars, notches cut in the end for spikes, and the finished rail loaded upon the cars to be taken to its destination.

The rail as made in this way is not only much better than the old welded rail, but the manual labor is very much decreased. The loss of iron is, however, somewhat greater. About five tons of steel are made at each heat.

CORROSION OF TIN AND TIN-LINED WATER-PIPES.

We have been much interested in reading the article of Professor S. P. Sharples in the July issue of the Journal, and are moved thereby to give briefly some of the results of our own practical experience, extending over more than twenty-five years, regarding the action of water on lead and tin pipes.

We have during this time put into and taken out from wells, springs, and aqueducts thousands of feet of tin and tin-lined pipes, and in no instance within our recollection, where we have seen the interior surface of any of these pipes after a year's use, have we failed to discover more or less corrosion.

Spring and well water seem to act upon the tin quicker than pond or river water.

Hundreds of feet of block tin pipe which we have put into wells we have been called upon to replace with new after ten or twelve years' use, the old pipes being so corroded as to be useless. Portions of some of them we have found to be so completely oxidized as to crumble at the touch, while other portions of the same pipe would be comparatively smooth and free from any corrosion.

Called upon a few days since to make some repairs upon an ordinary house-pump, we had occasion, in taking it down, to cut off the pipe leading to the well, and an examination of this showed it to be tin-lined lead pipe considerably corroded, the tin being completely eaten through, in many places of the size of small shot. Pursuing the investigation still further, we found a short piece of lead pipe (unlined), connected between the tin-lined pipe and the pump, which was perfectly smooth and free from the action of water. The solder joining the two, a mixture of probably nearly equal parts of lead and tin, was also bright and smooth.

The facts ascertained upon inquiry were these: —

Twelve years ago the pump was put in with lead pipe leading to well, and after a lapse of eight years the lead pipe was replaced by the tin-lined, with the exception of the short piece before mentioned, which for some reason was left untouched. Here, then, we have tin and lead under precisely the same conditions of exposure, the former practically useless after four years' use, while the latter was absolutely perfect and uninjured after twelve years' contact with water.

This case, as regards the durability of the lead, we should call exceptional, as most pipes of that metal exposed to the same test would show the action of the water in ten or twelve years.

We never had any reason for supposing that the tin furnished by any manufacturer was anything but commercially pure tin, but it is well-known among plumbers that occasionally a pig of tin is found which will not make good plumbers' solder by reason of the natural impurities contained in it, and our theory of the matter is, that it is these natural impurities existing in both lead and tin pipes which are corroded away by the water from the purer surrounding portions. In no other way can we account for the smooth and sound appearance often found in the same pipe in close proximity to badly corroded portions. A. M. Knight & Son.

Springfield, *July*, 1874.

MEMORANDA IN THE ARTS.

A Railway up Mount Vesuvius. — The success of the railway up the Righi (which, by the way, was suggested by the Mount Washington road in this country) is leading to other enterprises of the kind. One is proposed for Mount Pilatus, on the opposite bank of Lake Lucerne, and the *Liberta* of Rome describes a "funicular railway," the concession of which has been applied for to the Italian government by a company that proposes to construct it up to the crater of Mount Vesuvius. The model consists of an inclined plane presenting a gradient of thirty-three per cent., with a double line of rails, one for going up, and the other for the descent. The engine, which is fixed at the bottom of the plane, sets two drums in motion, round which the metallic cable is wound by means of which the trains are drawn up and let down simultaneously. This plan appears to be preferable to the rack-and-wheel system used for the ascent of the Righi, both as to

the working and cost. The section to the slope of the mountain at San Giuseppe is to be performed by common locomotive, the rope is then put on, and the ascent commences by the new plan. The whole length of the railway will be sixteen miles; the time required between Naples and the crater is calculated at an hour and a quarter, and the whole cost of the line is estimated at about four millions of francs. The funicular system is of course no new invention — the improvements lie in the details. The company are very sanguine as to the results; they say that, as upwards of 40,000 travellers annually ascend the Righi for the sake of its fine view, they may expect more to go up Mount Vesuvius, which offers a far more magnificent view.

Device to Prevent Water-Pipes from being Burst by Frost. — An English surgeon has patented a simple and ingenious contrivance for this purpose. He passes through the water-pipes an india-rubber tube of such diameter that the space inside is a little more than equal to the increase in volume of the water by freezing. There is thus secured in the inside of the pipe a space equal to the difference of volume between water and ice — the proportion being 1083 to 1000 — so that when the water freezes and expands it occupies the space thus reserved for it, instead of exerting its force on the pipe. The india-rubber tube is always kept full of air, so that when the water freezes it finds at every point the necessary space to occupy, for by compressing the tube it displaces the air and takes its place. Again, when the ice melts the air-tube expands, ready to be acted upon by another frost. The air is supplied from a reservoir, which is acted upon by the water-pressure, so as automatically to put the air-tube under an exactly corresponding degree of tension. By heating the air in the tube the ice in the pipes can be thawed. This application is peculiarly useful in the case of water-closets, and in preventing the supply of cold water to engine-boilers from being interrupted by frost. The invention can also be applied to preventing the explosion of kitchen boilers.

Mud Spots on Varnish. — On this subject *The Carriage Monthly* remarks: "High grade finishing varnishes, whether of English or American makes, possess their wearing qualities from the simple fact that they retain their elasticity or oily principle to a great length of time. The surface hardens sufficiently to resist dust and to admit of being washed, but the body of the varnish remains soft and sensitive, and mud allowed to dry on the surface of the varnish both stains it and extracts by capillary attraction the oil contained in the varnish. Each spot of mud, according to its size and shape, acts on the varnish immediately under it, but no further, from the fact that a suction is created by the evaporation of the moisture contained in the mud. Different kinds of soil act with more or less injurious effects. The sandy soil of New Jersey would have but a slight effect on a varnish which would be badly stained by the more adhesive clayey soil of Indiana or Kentucky, and the filth of a large city would be still more fatal to the gloss of the varnish."

PRACTICAL RECIPES.

Desilvering. — It is sometimes useful to know how to dissolve silver without attacking copper, brass, or German silver, so as to remove the silver from silvered objects, plated ware, etc. A liquid for the purpose is simply a mixture of one part of nitric acid with six parts of sulphuric, heated in a water-bath to 106° F., at which temperature it operates best. By this means the old silver attached to plated ware, old daguerreotype plates, etc., may be removed and saved without any necessity for wasting acids in dissolving a large amount of useless metal.

A New Cement. — An improved cement for joining leather, wood, china, glass, and other articles was lately patented in England. The inventor describes its preparation thus: "I first take 1 lb. of acetic acid, and dissolve therein, in a jar or other vessel, ½ lb. of gelatin, ½ lb. of fish-glue, and 1 oz. of isinglass. The acid will dissolve the other ingredients cold, but the application of heat hastens the process. This I call solution No. 1. I then take ½ oz. of resin, and place it in a corked bottle with 2 oz. of spirits of turpentine till dissolved; or I take the same quantity of gum mastic, and dissolve it in spirits of wine; but this is more expensive, so I prefer the former, which I call solution No. 2. When thoroughly dissolved I take these two solutions, and mix and stir them well together. For shoemaking purposes, I sometimes add a third solution (No. 3), composed as follows: ½ lb. of gutta-percha, dissolved in 1 lb. of sulphide of carbon. This is to be put in a bottle tightly corked, and, when it is dissolved, add to it 2 oz. of the cement above named, composed of solutions No. 1 and No. 2 mixed together."

Gilding without a Battery. — A correspondent of the *Scientific American* gives the following receipt for this purpose: "Dissolve 20 grains chloride of gold in a solution of cyanide of potassium, 1 oz. to 1 pint pure water. Put the solution of cyanide of gold in a glass or porcelain jar; place in it the articles to be gilded, in contact with a piece of bright zinc in the solution near them; the process will be hastened by a gentle warmth. If the gold is deposited on the zinc, rub a little shellac varnish on it. The chloride of gold may be prepared by dissolving gold in *aqua regia* in the proportions of 16 grains gold to 1 oz. acids."

Agriculture.

FARMERS' EDUCATION.

Charles Dickens once said, in remarking upon agricultural matters, that "the part of the holding of a farmer or landowner which pays best for cultivation is the small estate within the ring fence of his skull." It is undeniably true that the cultivation of the brain is of the highest consequence to the farmer, as with that part of his animal domain in a bad state of tilth, his fields must remain in a fearful condition of impoverishment. How shall the farmer improve his mind; how can he properly educate himself? This is an important question and deserves to be answered. Let us first consider how he cannot educate himself. He certainly cannot by remaining in a condition of inaction and stupidity, or a state of despondency and doubt which speedily becomes chronic and incurable. A considerable number of our farmers who have reached middle life are filled so full of gloom and doubt, that there is not a crevice in their minds open wide enough to admit a cheerful ray of hope. They long ago gave up the idea of bettering their condition by thought and study, and abandoning effort, live very stupid and aimless lives. They are not industrious or intelligent enough to prosper in any calling, and if their vocation in life was changed, they would still prove decided failures. Any man who gives way to despondency when the path of life is dark and discouraging becomes speedily helpless and impotent. There is, we are free to admit, very much to discourage farmers in their calling. The petty annoyances of the farm cannot be winked out of sight. Besides small things, there is blight, and mildew, and drought, and wet, and winds, and hailstorms, and bugs, and worms, and grasshoppers, and woodchucks, and crows, to destroy or devour the results of incessant toil and care. The farmer, we are willing to concede, has more than a fair proportion of the disappointments and annoyances of life, and as it is the peculiar mission or office of education to lighten and lessen these burdens, so much greater is the need of mental culture in his case. Repining and inaction will never render less intolerable a single disappointment or hardship.

The education which the farmer needs, and which is essential to his success and happiness, is quite within his reach. It does not consist of abstract knowledge or metaphysical acumen, but of simple facts derived from reading, observation, and reflection. All learning and culture are not derived from books, although these are essential in explaining and systematizing facts, and starting a beginner on the road to knowledge. To learn to think independently and originally is a great acquisition, and when acquired it inspires so much confidence in one's self that a radical change of character is often effected. There are plenty of books within the reach of most farmers of even limited means, and there is plenty of leisure to read them. It is not the busiest farmers that oftenest complain of want of time to read, but the laziest. One book of standard authority on any subject, well studied, is better than a dozen. Read and *think;* also, carefully observe and analyze the facts of nature. The moral influence of reflection and observation, when in the right direction, is very great. The farmer has around him the cereal plants, grasses, flowers, rocks, soils, trees, minerals, and animals. His opportunities for observation are very great, and there is every incentive to gain knowledge. The cultivation of the mind leads directly to a proper and profitable cultivation of the soil, and quite all thrifty farmers are well read and thinking men. The standard of education among farmers must be raised, and it had better be accomplished by *self-culture*, by home reading, home thinking, and home observation.

THE HAY CROP.

The working forces at the farm have been so far turned in the direction of building, during the present season, that but little attention has been given to the raising of the cereal crops. With the exception of a fine field of summer rye, the hay crop is the only one cultivated. The farm presents almost an entire area of waving grass, with honey-suckles, clover-blossoms, and buttercups dotting the wide expanse. We are sorry to be compelled to say that these flowers are not the only ones to be seen, for we have more than a fair sprinkling of the pretty but unwelcome *daisy* in our meadow. We conclude that it is simply impossible to extirpate this weed, when the roadsides and neighboring fields are full of it. The grass seeds grown in Canada and at the West are unfortunately full of the seeds of the yellow dock and other noxious plants. Every year on newly seeded fields much labor is required to remove these plants, and it is tedious and annoying work. To maintain clean fields requires a large amount of labor and care, and after having done our best the weeds will flourish.

Several years ago, by the use of crude sulphate of ammonia, we entirely destroyed the daisy plant on a large field, and secured a vigorous growth of timothy and clover, but the modest

little flower, with its tints of yellow and white, now rises high above the grasses, and appears as obstinate and defiant as ever.

The hay crop will be large in this section, as the rains have been abundant and the weather in every respect favorable.

FRUITS.

Fruits of all descriptions will be very abundant the present season. The apple crop never looked more promising, and every peach-tree is loaded with fruit. Pears, so abundant last year, will be no less in quantity this. The trees are very vigorous, and making heavy growths. Grapes promise well as to quantity, but they are two weeks behind, and there is great danger of the crop failing to reach maturity. The cold, late spring, while favorable for apples and pears, was unfavorable for the grape crop. Cold house grapes look remarkably well, although backward. Upon the whole, the fruit crop, if no misfortunes happen, will be an extraordinary one, and we may well rejoice and be glad.

THE NUTRITIVE VALUE OF POTATOES.

On this subject Dr. E. Smith, in his book on "Foods," recently published in the "International Scientific Series," gives the following interesting facts: —

"The relative value of Potatoes is determined in a general manner by their specific gravity, just as a similar estimation is made of an apple or an orange by weighing it in the hand, for, the heavier in relation to bulk is any given potato, the greater is the amount of starch. If several potatoes be thrown into a solution of salt, and water be added until some of them sink and others swim, the specific gravity of the saline solution will be that of the potatoes as a whole. J. J. Pohl found the following relation between the specific gravity and the proportion of starch: —

Sp. Gr.	Starch in 100 parts.	Sp. Gr.	Starch in 100 parts.
1.090	16.38	1.107	20.45
1.093	17.11	1.110	21.32
1.099	18.43	1.123	24.14
1.101	18.98		

"The quantity of ash or saline materials present in 100 parts of the fresh potato, varies with the kind, as shown by T. J. Herepath. Thus: Forty-fold, 0.88; Prince's Beauty, 1.06; Maggie, 1.09; Axbridge Kidney, 1.27; White Apple, 1.30. The proportion of potash in the salts of potato is very large, and does not vary much in the several specimens examined, the limits being 53.03 per cent. in the Fortyfold, and 55.73 per cent. in the Maggie. Potatoes are deficient in mineral matter, so that they are unfit to be a sole food, but that defect is supplied by the addition of hard water, milk, and other elements of food. There are 760 grains of carbon and 24 grains of nitrogen in 1 lb.; so that more than 2½ lbs. of potato are required to equal 1 lb. of bread in carbon, and more than 3½ lbs. in nitrogen. Hence, when potatoes are 1d. per lb., and bread 1½d. per lb., the former are two to three times dearer than the latter, but the former are valuable for their juices in addition to their nutritive elements. New and waxy are said to be less digestible than old and mealy potatoes, but the time required for digestion may be regarded as nearly the same as for bread, viz., from two and a half to three and a half hours. Ten grains of potato consumed in the body produce heat sufficient to raise 2.6 lbs. of water 1° F., or to lift 1977 lbs. 1 foot high. The water in which potatoes have been boiled is not used as food, for it is not only nearly destitute of nutritive matter, but is said to contain substances which are deleterious to health. In my experiments, the effect of eating good potatoes, whether new or old, was less than that of rice. In two experiments, 8 oz. increased the carbonic acid evolved in the respiration by 1.27 grains per minute, and the quantity inspired by 52 cubic inches per minute. The rate of pulsation and respiration was slightly lowered."

ENGLISH DISHES FROM MILK OR CREAM.

Junket. — This is an ancient English dish, being mentioned by Milton in "L'Allegro." It was such a favorite that the word became a synonym for rural feasting. In its origin, however, the name is Italian, *giuncata*, which comes from *giunchi*, the reeds or rushes on which the curdled milk was put to drain. The London *Agricultural Gazette* gives the following as a "well-tried and successful receipt" for its preparation: "Take one wineglass of brandy and two tablespoonfuls of moist sugar. Mix well these ingredients, then pour upon this mixture one quart of milk warm from the cow. Stir all together, then add three or four teaspoonfuls of essence of rennet. If that used is home-made from salted vells, one tablespoonful will be required. Let it stand an hour or an hour and a half, keeping it covered at first, not to cool too suddenly, or it will not turn so firmly, nor will it be so tender. Then grate nutmeg over it, and cover it with cream. The junket should, for obvious reasons, be mixed from the first in the dish in which it is to be served on the table, for it would otherwise appear in broken fragments, instead of the white, tender, delicious whole."

Devonshire Cream. — The "clotted cream" of Devonshire is another famous English delicacy, the manufacture of which is described by the same authority thus: "Set up the milk in tin or copper vessels, and if possible on the stove on which it is to be heated. It should stand twelve hours and be very gently placed on the stove if needful to be moved; it should there be gradually made scalding hot, so that the cream just rises in blisters; on no account, however, allow it to boil. It should be allowed to cool very gently, and the cream remains twelve hours longer on the milk, when the whole should be skimmed and lifted off. To make butter from this scalded cream as in Devonshire, it should be gently beaten by the hand or a large wooden spoon for a few minutes and it will become butter. Two or three days' cream may be kept to be made up into butter if more convenient to do so."

Cream Cheese. — To make this take one quart of fresh cream, not scalded. If not desired very rich, add one pint of new milk, warm it by letting it stand in hot water until it is about the heat of milk from the cow. Add a tablespoonful of rennet, let it stand until it is thick, then break it slightly with a spoon, and place it in a frame eight inches square and four inches deep, in which previously place a fine canvas cloth. Press it slightly with a weight on a loose board, to slip inside the frame. Let it stand twelve hours, then put a finer cloth in the frame. A little powdered salt should be put over the cloth; leave it without the weight — it will be fit for use in a day or two.

Bath Cheese. — To one gallon of new milk add two quarts of cold spring water, and two tablespoonfuls of rennet. This milk and water should be made about as warm as new milk from the cow. When it is turned thick, take it gently out of the vessel with the skimming dish, and lay it in a small vat of suitable size for the cheese to be about three inches thick. A canvas cloth must be placed in the vat; apply dry cloths every twelve hours for two days, when it should be turned out on a plate with another over it. The cheese should be turned occasionally and it will be fit for use in about ten days. All these products of the dairy are particularly grateful food during the hot days of summer.

NOTES AND MEMORANDA.

Good Advice on Thinning Fruit. — A writer in *The Agriculturist* says: "It takes no more time to pick off a little apple in the summer than it does to pick the same apple in the fall — and with me the fall is the busiest season of the year. I used to think that thinning fruit was one of the refinements of horticulture which those of us who grow fruit largely for market could not stop to bother with. But a friend's experience convinced me of my error. If there are 2000 apples on a tree in the summer, and I let them grow, I have to pick them all in the fall. If this is as many again apples as the tree ought to bear, the 2000 apples would fill, say, five barrels. Now, if I pick off 1000 of the smallest, and poorest, and specked, and wormy apples in the summer, the probabilities are that the 1000 left on the tree would grow so much larger that they would fill the five barrels as before. We pick 2000 apples in either case, and get the same amount of fruit. What then, do we gain? In the first place, the 1000 apples do not exhaust the tree as much as the 2000. There is as much fruit by measure, but it consists largely of material that takes little from the tree or the soil. There is only half as much seed, etc. We ought to thin out at least enough to leave the tree strength enough to bear a full crop the next year. In the second place, the 1000 apples are worth much more than the 2000; and last, but not least, the trees will bear every year." We do not remember to have seen the case stated in a manner more concise or convincing.

Recently Planted Trees and Shrubs in Hot Weather. — A recent number of *The Garden* remarks: "This is a trying time for young trees. Those that were set this spring, and have appeared to be doing well thus far, may succumb to the long continued drought and heat of midsummer. It is safest to mulch all young trees, but where this has not been done, all those that show signs of suffering should be attended to at once. A timely mulching may save the tree. It makes but little difference what material is used so that the soil around the tree is prevented from losing its moisture by evaporation. Stones, if most convenient, will answer as well as anything. If the trunk is fully exposed to the sun, it should be protected from intense heat. A couple of boards tacked together like a trough, and set up against the trunk, will furnish the required shade, or the trunk may be bound with a hay rope, or be loosely strawed up as for winter protection."

Fruit-Trees and Market Gardens in Great Britain. — According to a Blue-book return, just published, the extent of land used for fruit-trees of any kind in Great Britain in 1873 was 148,221 acres. This is a smaller acreage than was returned in 1872; but the decrease has chiefly occurred in consequence of incorrect returns under this head in previous years, in those parts of England where fruits-trees are not extensively planted, and in Wales. The extent of market-gardens in Great Britain in 1873 was 37,884 acres. Of this number 34,743 acres were in England — the counties of Middlesex, Essex, Kent, and Surrey containing 18,542 acres, or 44.7 per cent. of the market-garden land in England.

USEFUL RECIPES.

Coloring Wash for Fences and Out-Buildings. — The following cheap and excellent wash for wooden fences and buildings owes its durability chiefly to the *white vitriol*, which hardens and fixes the wash: —

Take a barrel and slake one bushel of freshly burned lime in it, by covering the lime with boiling water. After it is slaked, add cold water enough to bring it to the consistency of good whitewash.

Then dissolve in water, and add one pound of white vitriol (sulphate of zinc) and one quart of fine salt.

To give this wash a *cream* color, add one half a pound of yellow ochre (in powder). To give it a *fawn* color, add a pound of yellow ochre and one fourth pound of Indian red. For a handsome gray *stone* color, add one half pound of French blue, and one fourth pound of Indian red. A *drab* will be made by adding one half pound of burnt sienna, and one fourth pound Venetian red.

For brick or stone, use half a bushel of lime, and half a bushel of hydraulic cement.

To Remove the Iron Taste from New Kettles. — Boil a handful of hay in them, and repeat the process if necessary. Hay water is a great sweetener of tin, wooden, and iron ware. In Irish dairies everything used for milk is scalded with hay water.

A Simple Trap for Night-Flying Insects. — A writer in *Les Mondes* says that he is enabled to materially reduce the number of insects which prey upon the flowers and fruits of his garden, by covering the inside of an old tub with liquid tar, and at twilight putting a lighted lantern within, leaving the whole out overnight. The bugs, attracted by the light, are caught and held fast by the tar.

FACETIÆ.

A Carnivorous Plant. — The fact that some plants eat insects, and digest them also, is now well established, but the harrowing description of a "man-eating plant," which is going the rounds of English papers, is doubtless a *canard*. This voracious vegetable is said to be a native of Madagascar, and to trap men and women as the Dionæa does flies. This is a sample of the account which an "eye-witness" gives of it: "The retracted leaves of the great tree kept their upright position during ten days; then when I came again one morning, they were prone again, the tendrils stretched, and nothing but a white skull at the foot of the tree. The indescribable rapidity and energy of its movements may be inferred from the fact that I saw a smaller one seize, capture, and destroy an active little lemur, which, dropping by accident upon it while watching and grinning at me, in vain endeavored to escape from the fatal toils."

To Determine the Sex of Eggs. — A writer in the *Prairie Farmer*, after describing the various rules that have been given for determining the sex of eggs, lays down this rule of his own, which we have no doubt is as good as any of the others: "My rule, so simple and easy of application that any one living within the regions of modern civilization can have the means of practising it, was given me by a good old lady, who was famous in her day as a successful chicken-raiser. I am so well satisfied with it that I never trouble myself any more by testing the theories of others on this subject. My mind is perfectly at rest on this point, at least in the management of poultry, and now my chief study is to produce the finest specimens of the breed of my choice, be they either cockerels or pullets. The rule is, After you have picked out the eggs to be set, by whatever other rule you may fancy, carry them to the nest in a hat if you desire cockerels, or in a sun-bonnet if you wish to obtain pullets."

A Remarkable Manure. — The following testimony to the virtues of a patent manure was recently received by its owner: "Dear Sir, — The land composing my farm had hitherto been so poor that a Scotchman could not get a living off it, and so stony that we had to slice our potatoes and plant them edgeways; but, hearing of your manure, I put some on a ten-acre field surrounded by a railroad fence, and in the morning I found that the rock had entirely disappeared, a neat stone wall encircled the field, and the rails were split into fire wood, and piled up systematically in my back-yard."

Boston Journal of Chemistry.

Jas. R. Nichols, M. D., *Editor.*
Wm. J. Rolfe, A. M., *Associate Editor.*

BOSTON, AUGUST 1, 1874.

ALCOHOL: ITS RELATIONS TO THE ARTS AND TO MEDICINE.

The brief article upon Alcohol, published in the May number of the Journal, excited an unusual interest, not only among our patrons, but among a large class who read the article as copied into other journals. The grounds taken were, that alcohol is not an agent indispensable to the physician and artisan; and that it might be driven from the world without serious detriment to medicine or any art process. Within a period of a quarter or half a century, chemistry has made rapid strides, and many new substances have been isolated or discovered which are well calculated to supply the place of alcohol in medicine and the arts. Prominent among these are glycerine, carbolic acid, bisulphide of carbon, benzine, and other products of the distillation of coal and petroleum. Alcohol has been employed in the arts for a great variety of purposes, but largely for dissolving gums, and holding in solution substances used for dyeing and other purposes. It has also been extensively used for obtaining readily a flame free from carbon deposits. This latter use can now be dispensed with, as coal gas is very generally introduced even into small communities, and this agent, burned in connection with a current of air, affords a clean, hot flame, better and cheaper than that of alcohol. In places where coal-gas cannot be procured, the vapor of naphtha, mixed with steam or air, may be used to supply a flame quite as desirable as alcohol. The dissolving of gums is now a far easier and cheaper process than formerly, and alcohol may be dispensed with altogether in the process. Shellac, so largely employed by hatters and cabinet-makers, is now dissolved in strong alkaline solutions of soda and potassa. Formerly alcohol was used exclusively. As regards art processes, there are perhaps hundreds where alcohol might prove very *convenient*, but there is hardly one where no satisfactory substitute can be readily furnished.

It is commonly supposed that to the apothecary and physician the agent is one of the first importance, and it is held that the business of the former could not be conducted without its employment. In glancing along the line of bottles in a well stocked druggist store, it is obvious that a considerable number contain alcohol in some form of association or combination, but this does not prove that it is absolutely necessary in medicine. The numerous tinctures of plants, roots, etc., which comprise the bulk of the contents of these bottles, are now replaced by extracts of the active principles, which need not contain a drop of alcohol. In carefully examining the list of medicinal agents as presented in our pharmacopœia, we fail to find a single one containing alcohol in a free or uncombined condition as an absolutely necessary ingredient, which might not be dispensed with without serious detriment to life or health. Ether, chloroform, and hydrate of chloral, although manufactured from or through the agency of alcohol, do not contain any of the agent. A wide distinction must be made between the employment of alcohol by the chemist to *construct new* compounds, and its use in its distinctive unchanged condition for other purposes. As an agent from which to construct new bodies by chemical change, it is important. The grouping of atoms of hydrogen, carbon, and oxygen as presented in alcohol is convenient for the purposes of the chemist, as by replacement or substitution he is able to produce new agents of great usefulness. At the present time we perhaps have no substance which can fully take the place of alcohol in some peculiar chemical reactions, and therefore in the laboratory it must continue to be employed, unless we are willing to dispense with some really useful agents. But it need never be seen outside the walls of the laboratory; it belongs to a class of bodies important only in chemical manipulation, and it is urgently useful to the practical chemist alone. If it is used only as a chemical agent, and is found only in association with those other substances needed in chemical manipulation, it ceases practically to exist. In itself it occupies no place among absolutely necessary articles; but as a chemical substance from which, by decomposition, other important agents are produced, it deserves recognition.

THE CENTENNIAL OF CHEMISTRY.

The committee appointed to carry out the plan referred to in our last number for some appropriate recognition of the "Centennial of Chemistry," have issued an address to the chemists of America, inviting them to meet at Northumberland, Pennsylvania, on the 31st of July, to celebrate the memorable epoch. They have also issued the following "circular," copies of which may be obtained by addressing H. Carrington Bolton, chairman of the committee, School of Mines, Columbia College, New York city: —

"Northumberland is situated at the junction of the North and West Branches of the Susquehanna River, about sixty miles north of Harrisburg. The scenery in this region, always picturesque, is at this point exceedingly beautiful, and those visiting Northumberland will be fully repaid by the beauties of nature alone. A short distance from the town, in a hillside cemetery, charmingly located, lie the remains of Joseph Priestley; the house he built, and in which he died, is in perfect preservation; many relics of him are found in the town; here, too, dwell his descendants, who honor and revere his name. These and other considerations influenced a majority of the committee to call the meeting at Northumberland; here, then, let those gather who are willing to pay a tribute to the memory of the good and great man who laid the corner-stone of chemical science.

The memorial exercises have not been definitely arranged; but it is expected that they will include

I. An Address by Professor Joseph Henry.

II. A Sketch of the Life and Labors of Joseph Priestley, by Professor Henry H. Croft.

III. A Review of the Century's Progress in Theoretical Chemistry, by Professor T. Sterry Hunt.

IV. A Review of the Century's Progress in Industrial Chemistry, by Professor J. Lawrence Smith.

V. An Essay on American Contributions to Chemistry, by Professor Benjamin Silliman.

In order to add to the interest of the occasion, a Loan Exhibition will take place during the meeting for displaying apparatus, books, manuscripts, etc., belonging to Dr. Priestley, or other objects illustrating the history of chemistry. Gentlemen receiving this circular are earnestly requested to contribute any-

thing in their possession appropriate to this Loan Exhibition.

In order to assist the local committee in arranging accommodations, those planning to attend the meeting are requested to send their names to Dr. Robert B. McCay, secretary of the local committee, Northumberland, Pennsylvania; also to indicate whether accompanied by ladies, and how many. Gentlemen should reach Northumberland on the evening of July 30th; on arriving, they are requested to report to Dr. Robert B. McCay, at the headquarters of the local committee. Hotel accommodations in Northumberland, and Sunbury, two miles distant, are ample. Price, two dollars per day. A large number will also be entertained by the hospitable residents of Northumberland.

Northumberland lies on the Northern Central Railroad of Pennsylvania, which connects at Elmira with the Erie Railroad, and at Harrisburg with the Pennsylvania Central Railroad; it is therefore accessible from all points. Trains leave New York at 9 A. M., by the New Jersey Central, via Easton and Reading, and at 9.30 A. M., by the Pennsylvania Railroad, via Philadelphia, both connecting at Harrisburg with a train reaching Northumberland at 7.10 P. M. It may also be reached from the east by the Delaware, Lackawanna, and Western Railroad, via Scranton. Those preferring night travel will find trains by the various routes to accommodate them.

Parties travelling from the East can obtain excursion tickets on presentation of this circular at the offices of the Pennsylvania Railroad Company, 526 Broadway, New York. The tickets will be issued at the reduced price of $8.50 for the round trip, and will be good from July 25th to August 10th. The price of round trip tickets from Philadelphia will be $6.55."

PHLOGISTON AND ENERGY.

One of the most striking paragraphs in Professor Cooke's "The New Chemistry" is that in which he refers to the *phlogiston* theory of Stahl. It is not reasonable, he suggests, to suppose that a theory so universally accepted by thinking men should be altogether absurd, and he points out that by merely substituting the word *energy* for Stahl's *phlogiston* we have "the modern doctrine of conservation of energy, one of the noblest products of human thought." We cannot refrain from quoting the remarks that follow: —

"It was not a mere fanciful speculation which ruled the scientific thought of Europe for a century and a half. It was a really grand generalization: but the generalization was given to the world clothed in such a material garb that it has required two centuries to unwrap the truth. Still, the sparkle of the gem was there, and men followed it until it led them into a clearer day. It is a great error to suppose that the theory of Lavoisier superseded that of Stahl. It merely added to it. Stahl clearly saw that the chief characteristic of burning was the development of energy, and, although he called energy phlogiston, and did not comprehend its real essence, he recognized that it was a fundamental principle of nature. He did not understand the chemical change which takes place in the process, and this Lavoisier discovered. But both Lavoisier and his followers, to a great extent, ignored the more important phenomenon in magnifying the less, and it is only within a few years that the true relations of the two have been understood. All honor to these great pioneers of science, and let their experience teach us that, in science, as in religion, we see as through a glass darkly, and that we must not attach too much importance to the forms of thought, which, like all things human, are subject to limitations and liable to change."

TELLURIUM.

The discovery of the rich telluride ores in the mountains of Colorado within a few years, has not only been of economic interest to the miner and widened the sphere of known minerals occurring in the Territory, but has also given to the mineralogist an opportunity to discover new minerals. From specimens obtained during the past summer by the U. S. Geological Survey of the Territories from the Red Cloud and Cold Spring Telluride miners at Gold Hill, Colorado, Dr. Endlich, the mineralogist of the Survey, has obtained the following results: —

Henryite, n. sp. A telluret of lead and iron with the formula $3PbTe + FeTe$, and containing only 0.25 per cent. of silver and no gold. Dedicated to Prof. Joseph Henry, Secretary of the Smithsonian Institute.

Schirmerite, n. sp. Formula (Au, Ag, Fe,) Te. Dedicated to Prof. F. L. Schirmer, Director of the U. S. Mint, at Denver, Colorado.

Native tellurium was also found occurring in a comparatively large quantity in quartz, and containing 92 per cent. Te.

THINGS WORTH NOTING.

The Metallic Character of Hydrogen. — The question whether hydrogen is really to be ranked as a metal, which is still debated by certain chemists, has had some light thrown upon it by the researches of MM. Troost and Hautefeuille, who have determined some new and important facts with reference to the combination of hydrogen with potassium and sodium. With two equivalents of these metals, hydrogen combines to form definite compounds. Heated to 200° C., potassium combines with hydrogen, but the combination is entirely destroyed at 900°. Sodium likewise combines at 200°, but the compound is broken up at 400°. These several new compounds possess all the characteristics of true amalgams. They have the metallic lustre and other physical qualities of metals — properties which are offered as new proofs that hydrogen is a true metal. These hydrides of sodium and potassium are pronounced to be true alloys. The same investigators also announce the discovery that palladium forms with hydrogen a definite compound, the constitution of which would be represented by the formula Pd_2H; and that this compound possesses the power of absorbing or dissolving hydrogen gas, like platinum, and in quantity conditioned by its physical state. This property of the compound probably explains the difference of numerical results obtained by Graham, according as he employed palladium wire or spongy palladium.

The Food of the Mastodon. — The *Philadelphia Medical Times* states that Dr. J. G. Hunt of that city recently received from Mr. Charles Stodder of Boston a mass which is said to have been recently extracted from such a position within the skeleton of a mastodon as to show that it had formerly been in the stomach of the animal. After getting rid of all opacity in the material, it was at once seen that fragments of plants formed the bulk of it. Both cryptogams and flowering plants were present. Stems and leaves of mosses of several species were in large abundance, with cells as distinct as though gathered yesterday. Large numbers of minute, round, and black opaque bodies, which doubtless are spores of the mosses, were quite apparent. A filament of a confervoid plant was also discovered; cells in a single linear series, square, and similar in appearance to some now found living in the water. There was one stem of a flowering plant an inch long, the central part decayed and gone, the outer layer of cells as distinct and perfect as when alive. Many fragments of marsh plants, — not mosses, — but too much broken to justify a guess as to species, and shells of entomostracæ and ciliated organisms, perhaps infusoria, could be clearly detected. That the mastodons were vegetable feeders their dentition plainly shows, and the examination indicates also that they were omnivorous in taste, not being confined to the soft cryptogams of the bogs, but eating the branches of shrubs, and perhaps young trees as well; for bark and well-marked spiral vessels were present. No fragment of coniferous plants could be detected, and it is probable that mastodons did not eat such plants.

Meteoric Dust. — Nordenskjold, the Swedish traveller, has recently found in the ice and snow of the Polar Sea a black dust. This he melted and subsequently submitted to a chemical analysis, which proved that it was composed of nickel and cobalt, and similar in constitution to the meteorites. It seems probable, therefore, that the powder is actually due to the disintegration of these aerial bodies at a short distance from the earth.

Big Steamships. — According to the *American Manufacturer*, the six largest steamships in the world are the Great Eastern, owned by the International Telegraph Construction and Maintenance Company, 674 ft. long, 77 ft. broad; the City of Pekin, lately launched on the Delaware River, Pacific Mail Steamship Company, 6000 tons, 423 ft. long, 48 ft. broad; the Liguria, Pacific Steam Navigation Company, 4820 tons, 460 ft. long, 45 ft. broad; the Britannic, White Star, 4700 tons, 455 ft. long, 45 ft. broad; the City of Richmond, Inman, 4600 tons, 453½ ft. long, 43 ft. broad; and the Bothnia, Cunard, 4500 tons, 425 ft. long, 42½ ft. broad.

An Artificial Sea. — The French Government has recently adopted a scheme for the formation of a great inland sea in Algeria, 190 miles long by 36 broad, to the south of Biskra. It is thought by the *Revue des Deux Mondes* that the result of this measure will be a great improvement in the climate of the interior, a great addition to the facilities for inland transport, and the introduction of commerce and civilization into the very heart of Africa. The Chott Mel-Rir (*Chott* implying a bed of a lagoon), the proposed site of this inland sea, is found to be at least 27 mètres below the Mediterranean; while the Chott Sellem, with which it communicates, lying between it and the sea, is 13 mètres lower still. A chain of chotts, of smaller area, but equal depression, extends thence to within 18 kilomètres of the Gulf of Gabes, and a canal connecting the nearest chott with the sea would admit the waters of the Mediterranean, and convert the desolate region of Chott Mel-Rir into a great inland sea. The estimated cost is only 15 millions of francs, and the engineering difficulties, after the experience gained during the construction of the Suez Canal, would be inconsiderable.

A French School of Horticulture. — The *Revue Horticole* thus summarizes the programme of the newly-established school of horticulture at Clermont-Ferrand: "The institution is intended to be a centre of instruction, where pupils may acquire sound and useful instruction in horticulture; where they may be taught how to cultivate a garden properly; how to profit by all the advantages it offers; how to remedy its disadvantages, supply its defects, employ manures, prune trees, acquire a knowledge of fruits: where, in a word, they may be instructed in all that a gardener should know, whether he wishes to devote himself exclusively to the culture of plants under glass for ornament or otherwise, to market gardening, or to fruit growing. In fine, in this school it is the object to make the pupils take an interest in their work, understand their business, and, having acquired instruction in physical and natural science, to enable them to turn them to profitable account."

EDITORIAL NOTES.

French Temperance Prizes. — The French Temperance Society, of Paris, offers for the year 1875 three prizes for competition. 1st. For determining by the aid of repeated chemical analysis, on a large number of samples obtained at random from retail shops in Paris and the Departments, the analogies and differences which exist between spirits of wine and the various alcoholic drinks; a prize of 1000 francs ($200). 2d. To ascertain whether it be possible, by analysis of their chemical or physical properties, to distinguish natural wines and brandies arising from fermentation of grape-sugar or distillation of the juice of the grape, from those of artificially prepared and fortified beverages; a prize of 500 francs ($100). 3d. To determine, by chemical observations and experiments, the differences which result to the system from the use of pure natural wines and alcohols, and of others manufactured and artificially fortified and compounded with spirits; a prize of 1000 francs. The treatises to be written either in French or Latin, and bearing a motto or device, accompanied with the name of the writer, in a sealed envelope, addressed to Dr. Lunier, general secretary, No. 6 Rue de l'Université, Paris, before December 1st, 1874.

A Bad State of Things in High Places. — Dr. Lankester refers, in his last report to the Vestry of St. James's, Westminster, to three cases of typhoid fever which had occurred in St. James's Place. He had directed inquiry to be made into the outbreak. The house belonged to a nobleman. After describing the defective state of the closets, the connection of the cisterns with the drains, and the impurity of the water, the doctor adds: "The whole condition of these things was one of entire neglect, and the only wonder is that dangerous disease had not broken out long since." This house is a specimen of the condition which he believes exists in a large number of the houses of the wealthier inhabitants of the parish. In these cases he had no power to enter till disease had broken out and sanitary aid was demanded; but he thinks it ought to be a warning to the wealthier inhabitants of this and other parishes of London, not to neglect the sanitary condition of their houses. We have no doubt that there are similar localities in our large cities where the same admonition is needed.

Seeing and Believing. — We find this amusing story in *Iron:* "The Italians stand almost alone among the Latin races in capacity for self-government; but, like ourselves, they occasionally produce well-marked specimens of the Dogberry. One of these the other day, at a municipal meeting at Genoa, complained of the unfair way in which the fumigation of correspondence from Naples had been carried on during the prevalence of cholera in that city. In support of his complaint, he stated that while the letters and newspapers thus received were perforated so as to admit the fumigating vapor, no such marks appeared on the telegraph forms; and he asked, if letters carried contagion from town to town, why might not telegrams also? The burst of laughter with which his colleagues received this *naïve* bit of reasoning failed to enlighten the speaker, for he immediately opened his pocket-book, and, exhibiting a telegram he had received during the epidemic, triumphantly asked if 'seeing was not believing.'"

A Correction. — A correspondent reminds us that the Marengo County to which reference was made in our June number is in Alabama, not in Mississippi, as there intimated. The mistake was doubtless a slip of the pen on the part of the excellent Southern journal from which we took the paragraph. Our friend, by the bye, endorses the interesting account there given of the origin of the name of the county.

ATOMS.

The beneficial effect of Alpine health resorts has been attributed to the greater abundance of ozone in the mountain air, and the theory is supported by recent investigations; but Dr. Haller, of Switzerland, says that though it seemed likely that as one ascended, an increase of ozone would be met with, yet at the highest accessible points there was no marked difference. — The New York *Evening Mail* speaks of the burning of some ice-houses as "ice-cremation." — The charming little *Nursery* still remains without a rival, and out of the reach of all rivalry. — The custom-house returns show that the quantity of opium imported into the country, now nearly 250,000 lbs. annually, is ten times more than it was thirty years ago; and it is the opinion of physicians and druggists that not more than one third of the quantity is used for medical purposes. — Arago says that "he who, outside the range of pure mathematics, utters the word *impossible*, is wanting in prudence." — Great Britain has now 36,000,000 spindles in her mills, with nearly 400,000 looms and 650,000 workmen; the United States, 8,000,000 spindles; France, 5,700,000; the German Zollverein, 4,300,000, of which Alsace possesses 1,700,000; Russia, 2,000,600; Switzerland, 1,800,000; Austria, 1,400,000; Spain, 1,400,000; Belgium, 600,000; Italy, 500,000; and other countries more than 2,000,000. — A recent writer on food says that a gentleman of his acquaintance has for the last fifty years eaten daily two eggs at breakfast, making 730 per annum, or a total for the whole period of 36,500 eggs. — It may not be generally known that the ton used in the returns and calculations of the United States census is invariably the net ton of 2000 lbs. and that the ton used by the Treasury Department in its statement of imports and exports is invariably the gross ton of 2240 lbs.; it is also worthy of note that the values of foreign imports are given in gold, and of domestic exports in currency. — A neat thing in hair-cutting in vogue among the Nagas, a tribe in British India, is described as follows: the operator inserts beneath the luxuriant locks of his customer a hatchet or knife, whereon he pounds with a wooden mallet until the edge shines through. — Opium is being successfully cultivated in Victoria. — In 1873, about 8000 American mowers and reapers were sold in Europe; and it is estimated that, during the present year, no less than 12,000 mowers will be sold abroad, representing a value of $1,000,000 paid to American manufacturers of this class of machinery. — The tomb of Belzoni, the famous Oriental traveller, at Timbuctoo, is in a dilapidated condition, and his native city, Padua, is about to undertake the work of restoring it. — The largest crane in the world has lately been erected at Barrow-in-Furness, Eng., and it lifted 100 tons of rails on its experimental trial. — It is said that there is a stove in the Capitol at Richmond, Va., which has been in regular use ever since 1770, and is not worn out yet. — At Meiringen, Switzerland, the people wanted to celebrate the adoption of the new constitution, and as they had no cannon they substituted a sort of industrial salute by a great banging of anvils got together for the purpose. — Mr. John Mackintosh, whose name has become in England a synonym for a water-proof coat, has patented a process of mixing carbon with india-rubber in a peculiar way, and claims that the product is better adapted for a variety of uses in the arts than any compound before known. — Dr. Vogel, of Berlin, in a letter to the *Philadelphia Photographer*, says that old daguerreotypes that have turned yellow, blue, or black, will often become as bright as new if simply placed in a solution of cyanide of potassium. — A writer in an English medical journal considers it well established that "some relation exists between a depressed state of the barometer and the prevalence of frontal headache."

LITERARY NOTES.

The Appletons have just published *Physiology for Practical Use*, edited by James Hinton, with an Introduction by E. L. Youmans. This work was planned and executed with a view to making it thoroughly practical. The editor, well known as a distinguished aural surgeon of London, and also as the author of several valuable medical works, arranged with some of his professional friends to contribute a series of papers on health to the "People's Magazine." Each article was written by one who had an intimate practical knowledge of the special subject on which he wrote. The papers have since been carefully revised, and gathered up into this neat volume. In their present form, they seem to us excellently adapted for family reading or for use as a school text-book.

The same house issue Canon Kingsley's *Health and Education*, a collection of lectures and essays that are well grouped under that title. We have already enjoyed the perusal of several of them in "Good Words" and elsewhere, and are glad to see them reprinted in book form. We had marked some passages for quotation, but cannot find room for them in this number.

Mr. H. C. Lea, of Philadelphia, reprints in style hardly inferior to the English original, *A Treatise on Food and Dietetics*, by Dr. F. W. Pavy, whose work on "Digestion, its Disorders and their Treatment," is an accepted authority on that subject. In the present volume he has given us the first complete and systematic treatise of the kind in the English language. Several good, popular books on food have appeared within the past few years (of which Dr. E. Smith's "Foods," in the "International Scientific Series," is notably the best); but no one of them aims, as this larger and more elaborate work does, at a full and scientific treatment of the subject. The task has been ably and successfully accomplished, and the book will at once take its place as the standard authority in its special department.

Another new book from the same publishers is a revised and enlarged edition of Hartshorne's *Conspectus of the Medical Science*, which includes in one compact volume manuals of anatomy, physiology, chemistry, materia medica, practice of medicine, surgery, and obstetrics. It is intended for the use of students, and the first edition has been endorsed by leading teachers as the best compendium of its class. The revision appears to have been carefully and thoroughly done.

Lindsay and Blakiston have now ready the *sixth* revised and enlarged edition of Biddle's *Materia Medica*. This also is intended for the use of students, and is the work of the able professor of materia medica and therapeutics in the Jefferson Medical College. Though the fifth edition was published little more than a year ago, the demand has entirely exhausted it, and the author has made many improvements in the present issue. The new chemical notation has been adopted, the chemical descriptions remodelled, and much new matter has been added. The book is a handsome octavo of 435 pages, and the price is $4.00.

G. P. Putnam's Sons publish *Inflammation of the Lungs*, twelve lectures on tuberculosis and consumption by Dr. Ludwig Buhl, of the Munich University, translated from the second German edition by Drs. M. D. Mann and S. B. St. John. The author is well known as the originator of the infection theory of tuberculosis, which Niemeyer, Rindfleisch, and other eminent authorities have adopted and advocated. The discussion of the theory in these lectures cannot fail to interest even those who do not accept Dr. Buhl's conclusions.

The above books are for sale by Williams & Co., who have published in pamphlet form Dr. Nathan Allen's *Annual Discourse before the Massachusetts Medical Society*, on "Medical Problems of the Day." State medicine, public hygiene, practical medicine, physical development, mental culture, the temperance question, the laws of inheritance, and the law of human increase are the topics considered, and the last two are treated with special fulness and ability.

The Harpers have added to their rich list of books on Africa *Coomassie and Magdala*, the Story of Two British Campaigns in Africa, by H. M. Stanley. The author is not one of those who "flat out" after a first success in book-making. His first venture, though the interest in the subject gave it a great "run," was far inferior, as a piece of literary work, to the present volume, which is well written and not unworthy of the handsome dress the publishers have given it.

A pleasant summer book from the same house is Rev. Dr. Prime's *Under the Trees*, a series of gossiping papers, "light and choice, of Attic taste," as Milton says, and every way suited for vacation reading out of doors. *Barnaby Rudge* is the latest volume of the Harpers' cheap illustrated edition of Dickens, which grows in popular favor with each new issue.

Osgood & Co. have published *The Middle States*, another of their excellent home guide-books, and no less accurate and comprehensive than the *New England*, of which, by the way, they have a revised and enlarged edition for the present season. These are the first really good guides that have been prepared for travellers in this country, and we hope that companion volumes for other sections are to be added to the series.

The same house has issued Aldrich's *Prudence Palfrey* in book form — perhaps the best American novel of the season. It may be found, with all other new books, at Noyes, Holmes, & Co.'s.

The *International Review* for July contains a valuable article on "Coal and its Supply," by Professor Andrews, the Ohio State Geologist, with half a dozen other excellent papers on literary, historical, and theological topics. It will be remembered that we furnish the Review *with the* Journal for five dollars a year, its regular subscription price.

Medicine and Pharmacy.

THE TREATMENT OF DYSPEPSIA.

We find in the *London Medical Times and Gazette* a translation of an interesting lecture by Professor Leube, of Jena, in which are discussed the causes and appropriate treatment of that disease, or rather that group of diseases of the stomach to which "the time-honored name of dyspepsia" has been given. An abstract of the lecture will, we are confident, be acceptable to the readers of the Journal.

Leube first considers the question of the dependence of dyspepsia on alterations in the relative proportions of acid and pepsine in the gastric juice, and comes to the conclusion that in the majority of cases it is the acid which is present in too small a quantity, and not the pepsine. A small quantity of pepsine can, like other ferments, act on an indefinite quantity of nutritive material, though digestion goes on quicker in proportion to the amount of pepsine present. On the other hand, if the acid (hydrochloric, or perhaps lactic) be deficient in quantity in the gastric juice, digestion is enfeebled, or stops entirely. To determine these facts, patients were made to fast for a few hours and had twenty-five grammes of Carlsbad salt given them to assist in clearing out the stomach as much as possible. Then, at midday, a short time after they had eaten some dry cold meat, with or without mustard, some of the contents of their stomachs were removed with a sound, and examined as to their odor and reaction, and also as to the extent to which the digestive process had advanced. A specimen of each patient's gastric fluid was then filtered and divided into three parts, which were placed in three flasks of equal size, to the second and third of which two drops of hydrochloric acid, and of a neutral pepsine solution, were respectively added, the first being left without addition. The time was then noted which the fluid in each flask took to digest a piece of boiled fibrine of similar size at a temperature of from 35° to 40° C. The general result of many experiments was that the fluid in the first and third flasks had almost exactly the same digestive power, and the solution of the fibrine went on quite slowly; whereas in the flask to which acid had been added the fibrine was usually entirely dissolved in from twelve to twenty-four hours. Leube therefore considers that he is justified in recommending the more extended use of hydrochloric acid in the treatment of dyspepsia, especially as his own results in practice support his theoretical views. He orders eight drops of the acid in half a wine-glassful of water an hour after meals, and in severe cases gives it again at the fourth hour.

With regard to dyspepsia from so-called acidity, — that is, the acid in excess, — Leube expresses himself doubtfully; for in many cases where vomited matters have a sour smell they are not necessarily acid. He speaks, for instance, of a case of dilated stomach, whose contents had a neutral reaction, though they smelt fearfully sour. Even the presence of acid in excess does not contra-indicate the use of hydrochloric acid; for the acids on which it probably depends — the acetic and butyric — are useless for digestive purposes, while even the lactic does not act in combination with pepsine like the hydrochloric; it does its work slower, and much larger quantities are required to obtain the same result.

Dyspepsia due to excessive secretion of mucus (which acts as a ferment and gives rise to the production of useless acids, such as those above mentioned, besides carbonic acid) should be treated by alkalies — as the bicarbonate of soda — which not only neutralize these acids, but excite, if given in considerable quantities, a flow of normal gastric juice.

Changes in the quantity of the gastric juice as a whole, arising in persons with so-called torpid digestions, are difficult to treat. Here the irritation of the food alone is insufficient to excite the secretive action of the gastric glands, and so attempts are made to increase the flow by taking highly seasoned dishes, spices, and the like. These cases require much patience in their treatment. The use of irritant foods must be discontinued very gradually, and their place be filled by ether, alcohol, and bitters, but especially by cold water and ice, for these excite a reflex flow of saliva, which, when swallowed, acts as a most powerful stimulant to the gastric mucous membrane.

Leube lays great stress on the use of the stomach-pump or of a siphon-sound, both for the diagnosis and treatment of this affection. The habitual removal of the contents of the stomach checks the dilatation, and permits the organ to recover its size to a certain extent. The stomach should be regularly washed out every day, the patient's allowance of fluid limited as much as possible, and small pieces of ice or fruit-ices given instead. Solid food should be taken only in small quantities at a time. Probably galvanism is useful in some forms of dilatation of the stomach, by its action on the muscular coats; for muscular movement brings fresh surfaces of food in contact with the digestive secretions, while there can be little doubt that the contraction of the muscles assists the circulation in the veins and lymphatics, and so helps to remove absorbed products.

In conclusion, Leube discusses the best form of diet for dyspeptic patients. The relative digestibility of different foods has occupied the attention of many observers, but is not yet satisfactorily understood. We need to know more of the relative share which is taken by the different parts of the alimentary canal in the process of digestion. It is not at all desirable that a dyspeptic patient should have food ordered him which is only digestible by the stomach. Foods which by their consistence and form mechanically irritate it do not cause so much harm to it as foods on which the gastric juice can act easily, and which therefore remain long in it. Individual constitution and the nature of the particular disease must be also considered in deciding on forms of diet.

It is probable that young veal, chicken, pigeon, boiled fish, and underdone beef, are the most suitable foods for most patients — of course, with the exception of milk and eggs, which are the most digestible of all. Meat should be underdressed, not only because it becomes tough by much cooking, but because Fick has recently shown that the same gastric juice digests cooked meat three times as slowly as raw. Eggs should be taken soft-boiled, and not raw, for Leube has found by experiments on himself that their albumen is more easily digested when cooked than raw; and Fick has also shown that there is at any rate no advantage in the uncooked form over the cooked, so far as digestibility is concerned. Fat sauces must be abstained from, because they shield other food from the action of the gastric juice. The only vegetables which Leube allows are asparagus, young peas, carrots, and mashed potatoes. Bread he gives stale. He usually forbids all alcoholic liquors. If none of these foods agree with the patient, he gives him an extract of meat, or rather a peptone solution, prepared by the action of acid on meat *in vacuo* at a high temperature. A fine emulsion is produced, which has a slimy consistence and a pleasant taste, somewhat resembling Liebig's extract, but it differs from the latter in containing all the constituents of the meat. This extract is easily digested, and is tolerated by the most irritable stomachs. Patients with gastric ulcer lose their pains from the day they begin to take it. Of course the use of such an extract is not restricted to diseases of the stomach. It is indicated wherever an absolutely unirritating food is required — for example, in typhoid fever, dysentery, tubercular ulceration, and peritonitis.

JABORANDI.

This will be a new and strange word to many of our readers, but it is likely to become a familiar term in medicine, if the therapeutical virtues of the plant which it designates are as remarkable as represented. Dr. Coutinho, of Pernambuco, who had found it very useful in his South American practice, recently brought it to France, where it has been "sat upon" by the great medical authorities of Paris, and pronounced to be an important acquisition for the healing art. "Jaborandi" is the name by which the plant is known to the Indians, but botanists recognize it as the *Pilocarpus pinnatus*, one of the *Rutaceæ*, a native of the province of St. Paul, in Brazil. A great number of trials in the Hospital Beaujon prove that it is a powerful diaphoretic and an incomparable sialagogue or excitant of saliva. Its action is manifested in a few minutes, and with the utmost precision. Soon after its administration, perspiration streams down the patient's face and over the whole surface of his body. The saliva flows in such abundance that speech becomes almost impossible. The quantity secreted will be as much as three pints in a couple of hours. The bronchial secretion is also rendered much more active.

A remarkable fact observed by M. Coutinho is that the intervention of heat exercises only a secondary influence in producing the sudorific effects of Jaborandi. It is certainly better to administer the infusion warm, but it is by no means an essential point. One person, for instance, who has difficulty in obtaining a perspiration, fell into a profuse sweat on taking a cup of scarcely tepid Jaborandi tea, and that without going to bed. The mode of preparing it is simply to bruise four or five grammes of the leaves and small twigs, and infuse them in a cup of boiling water. Even when taken cold, the drug acts with very great energy. It is the first known example of a diaphoretic truly deserving of the name; that is to say, capable of directly provoking perspiration by a special stimulation

of the sudatory organs. Other sudorific medicines act principally by the heat they excite in the economy.

COFFEE AND MILK.

Several years ago, a foreign chemist — a German, if we remember right — advanced the theory that coffee is not often injurious unless taken with milk. Of course, there are exceptional cases in which it does not agree with a person in any form, but as a rule it is its combination with milk that troubles the digestive organs. There may be some grounds for this opinion. We have known of at least two persons who were obliged to give up the use of coffee, which they had always taken with milk, and who were led to try the experiment of drinking it without milk. After using the *café noir* for a year or more they find that it agrees with them perfectly, but a single cup of *café au lait* brings back the old digestive difficulties.

We refer to these cases because we see that M. Marchand, a chemist of Fécamp, has recently come to a similar conclusion concerning the mixture of coffee and milk. He does not appear to be aware that the idea is not a new one, but it is nothing strange for a Frenchman to be ignorant of scientific researches in other countries. *Galignani's Messenger* gives the following summary of M. Marchand's communication to the *Journal des Connaissances Médicales* on the subject in question: —

"Milk taken alone is acknowledged to be one of the most valuable aliments known, suitable to all ages and constitutions, and eminently digestible except in certain morbid cases. Coffee, on the other hand, is in itself an excellent tonic and stimulant, which favors digestion after meals. But when these two beverages are mixed together, as is universally the case at breakfast on the Continent, and pretty frequently so in England, a chemical exchange takes place, producing a new agent that is utterly indigestible, and therefore absolutely incapable of assimilation when the mixture is effected in proper proportions. Thus, when a customer enters a coffee-house, calls for his *café au lait*, and tells the waiter how much milk he wants in it, he is simply deciding how much of his money he chooses to waste on a useless compound, and how little nourishment he is resolved to take. To understand this, let us consider that the skin of animals may be boiled down so as to become an eatable substance; but that the same skins taken to the tan-yard will be converted into an imputrescible article, which will defy all the power of the gastric juice to extract any nutritive matter therefrom. Now, all proteine substances, brought into contact with tannin, will behave in the same way as the skin; they will combine with the tannin, and resist digestion as well as putrefaction. The infusion of coffee intended for ingestion is extremely rich in tannin; consequently, when brought into contact with the albumen and caseine contained in milk, it will instantly transform these ingredients into an insoluble leather; the only difference being, that this coriaceous substance will be in the shape of an impalpable powder instead of forming a continuous sheet. This inert precipitate will remain in the stomach until carried off by other food, producing no other effect save that of impeding the full action of the gastric juice."

ERASMUS AS A SANITARY REFORMER.

The following letter of Erasmus to Francis, Physician to the Cardinal of York, written in 1518 or 1519, is interesting for the light it throws on the social condition of England at that time, as well as for the advice it gives, some of which would not be discreditable to a health officer of our own more enlightened day: —

"I often wonder and lament how it happens that for so many years Great Britain has been afflicted with pestilence without intermission, particularly with the sweating sickness, a malady which seems peculiar to itself. We read of a city being delivered from a pestilence which had long ravaged it by the destruction and renewal of its buildings, in accordance with the advice of some philosopher. Either I am greatly deceived, or by some such plan must England be delivered. In the first place, they never think whether their doors and windows face north, south, east, or west; and in the second place, the rooms are generally so constructed that, contrary to Galen's rule, no thorough draught can be sent through them. Then they have a large part of the wall fitted with sheets of glass, which admit the light but keep out the air, and yet there are chinks through which they admit that filtered air, which is all the more pestilential because it has been lying there a long time. Then the floors are generally strewed with clay, and that covered with rushes, which are now and then renewed, but so as not to disturb the foundation, which sometimes remains for twenty years nursing a collection of spittle, vomits, excrements of dogs and human beings, spilt beer and fishes' bones, and other filth that I need not mention. From this, on any elevation of temperature, there is exhaled a vapor which, in my judgment, is by no means beneficial to the human constitution. Besides, England is not only surrounded on all sides by the sea, but many parts of it are very marshy, and it is intersected with salt rivers, to say nothing just now of the salt fish, of which the common people are wonderfully fond. I should have confidence in the island becoming more healthy if the use of rushes could be abolished, and the bedrooms so built as to be open to the sky on two or three sides, and if all the glass windows were so made as to open or shut all at once, and to shut so fast as to leave no chinks through which noxious winds could force a passage: since, as it is also sometimes healthy to admit the air, so is it sometimes healthy to exclude it. The vulgar laugh if you complain of their cloudy sky. I can only say, that for thirty years past, if I entered a room in which no one had been for some months, I would immediately begin to feel feverish. It would be an advantage if the vulgar could be persuaded to live more sparingly, and to be more moderate in the use of salt fish. Then there might be policemen who should have the charge of seeing that the streets were kept clean from filth, and they should also look after the neighborhood of the city. I know you will laugh at me for making myself anxious about these matters, but I do so out of friendship for a country which has so long afforded me hospitality, and where I would willingly spend the remainder of my life if I could. I doubt not that you in your wisdom know far more about these things than I do, but I wished to mention them, in order that, if my judgment should accord with yours, you may commend them to the consideration of the leading men of the country, for these things used to be the care of monarchs. I would very gladly have written to his Reverence my Lord Cardinal, but I had neither time nor anything to say, and I know well how immersed he is in the affairs of state."

MEDICAL MEMORANDA.

Infant Mortality. — Professor Gairdner, of Glasgow, has written a long letter to the *Herald* of that city, on this subject. Having pointed out that "among the rich and still more among the poor it is, on the great scale, impossible, without danger, to replace mother's milk by any other kind of milk or of nourishment," he arrives at the following highly important conclusion: "It follows that the safe and wholesome feeding of the infants of a large community depends absolutely upon preserving for its proper use the whole stock of available sustenance provided by nature in connection with the whole number of births in that population." The writer goes on to say that "the *supply* is here within certain limits, which can be readily understood, meted out by a natural law in strict proportion to the *demand*, and whoever restricts the supply by withdrawing unnecessarily even one of the sources provided, is responsible to that extent for starving the demand in some other quarter. The wealthy mother who declines nursing, does not escape responsibility for the evil consequences of her act;" for "she is wantonly diminishing the general stock of a food which no money can procure for the children of the poor." If this habit takes root in a wealthy and luxurious population, "the infantile death-rate will inevitably rise out of all proportion to the general death-rate." The writer shows how the truth of this is illustrated in Paris and the West End of London, and how the disastrous effect of the system, should it "unhappily extend throughout the structure of modern society," will "sap the very foundation of social prosperity," and work out the decline of modern, as of the greatest ancient nations, by leading to a "want of men."

Recovery from Wound of the Brain. — Dr. R. F. Baldwin, in the *Richmond and Louisville Medical Journal*, adds another to the list of cases in which recovery has occurred after severe wound of the brain. A lad sixteen years old was accidentally wounded by the discharge of a Colt's pocket-pistol in the hands of a companion a few feet distant. Upon receiving the shot, the boy fell with violence, but did not lose consciousness. The ball, about the size of a buckshot, entered the right frontal bone an inch above the centre of the eyebrow, and, passing through the brain, lodged in the occipital bone near the centres of the occipital cross. A silver probe passed by its own weight to the centre of the brain without touching the ball. As a precautionary measure he was bled, and Epsom salts were administered. The wound healed rapidly without any constitutional disturbance, and in ten days he returned to his home. He is still living in good health, and has never suffered the slightest inconvenience from the accident.

Iodized Albumen. — M. Collas, in the *Bulletin Général de Thérapeutique*, describes a new process for the administration of iodine. Alcoholic solution has been found too irritant in many cases, and as the iodine acts on the alcohol, forming a hydriodic ether, the tincture is liable to vary in its composition. Iodide of starch has been recommended, but this preparation is of variable strength, and has besides an unpleasant taste. Iodized albumen, M. Collas considers, obviates all these inconveniences, and can, without much difficulty, be formed into pills.

The albumen is prepared by agitating actively an albuminous solution with iodine in very fine powder or in solution in some appropriate vehicle. The mixture is at first highly colored, blackish-brown, but this color gradually disappears in several hours of contact, and the preparation no longer strikes the violet color with starch. The product is then desiccated under gentle heat in an air bath, when it may be made into pilular mass. The dose is so arranged that each pill shall contain 5 milligrammes of iodine.

The experiments at the Hospital Beaujon by Professor Dolbeau have shown that iodine thus prepared has no bad effects whatever. It may be continued for several weeks without stomach trouble or other inconvenience.

Croton-Chloral in Facial Neuralgia. — In *The British Medical Journal*, Dr. F. B. Lee reports the case of a lady, æt. 32, who had suffered for years from attacks of facial neuralgia, had had several teeth extracted, had been blistered behind the ears, and had tried numerous other means without avail. He prescribed croton-chloral in three-grain doses every four hours. After the third dose perfect ease was experienced, and, although three months had elapsed, there had been no return of the disease.

Poisoned by a Puff-Ball. — An English journal relates an incident which shows that it is not always advisable to investigate a subject too thoroughly before lecturing on it. Not long ago the Pharmaceutical Society in Edinburgh was promised a lecture by Mr. Sadler on edible and poisonous fungi, but when the evening came Mr. Sadler was ill. It has since been stated that Mr. Sadler's illness arose under rather singular circumstances. While preparing his lecture for the Pharmaceutical Society he accidentally swallowed a great quantity of the spores of a large species of puff-ball (*Lycoperdon giganteum*), and within the space of an hour and a half was seized with severe illness, accompanied with violent pains. The violent symptoms were not subdued until nine days after the first attack. Sir Robert Christison, Dr. Balfour, and Dr. William Craig, who attended Mr. Sadler, were of opinion that the continued irritation was kept up by the fungus spores. The giant puff-ball is edible in its young state, but its matured spores ought certainly to be avoided.

Lemon-Juice in Diphtheria. — M. Revillout, in the *Gazette des Hôpitaux*, recommends in the strongest terms the employment of large quantities of pure lemon-juice as a gargle. He says that he and his father have used it during eighteen years, and always with success, it being the most certain application yet known.

BREVITIES AND LEVITIES.

Anecdote of Claude Bernard. — *L'Union Médicale* tells a good story of the eminent physiologist. In the latter part of 1834 he first came to Paris, all his possessions in the world being a tragedy in verse — unacted, of course. The young poet, summoning up all his courage, rang the bell of a literary celebrity of the epoch. "I have called, sir," stammered out poor Claude, "to beg of you to peruse a tragedy which I have just completed, and to favor me with your opinion on my work. Here it is (drawing from his pocket a roll of paper tied round with a red ribbon): I will leave it with you, and in a few days will call again to hear what you think of it." "Stay, young man," M—— replied immediately. "You seem honest and intelligent, and I feel great interest in you. Now, take my advice: become an advocate without a brief, a doctor without a patient — anything you like; but for God's sake, abandon all your projects in dramatic literature. There may be in you the stuff of which a Corneille or a Molière is made. Never mind. Stick to pure science, and you will make yourself a name in it." The advice was followed, and we all know with what result. The tragedy, with its smart ribbon, never again left its author's pocket. Its title was "Louis VI." and it is now forever gone, Claude Bernard having long since committed it to the flames.

Almost a Tragedy. — Two actors in one of our cities narrowly escaped being poisoned to death while acting in a melodrama. In a scene where revellers were clustered about a bar, they clinked their goblets and emptied them of a pale yellow fluid resembling whiskey in color. One hurried off the stage apparently in great agony, the other fell on the floor in convulsions, and the manager announced that the actors had accidentally taken poison. It seems that the property man had hired some show-bottle from an hotel for the bar-room scene, the water in one of which was colored with bichromate of potash, and the other with red cochineal. Those who drank from the cochineal bottle escaped unharmed, the others suffered great agony all night; but with medical attention they were sufficiently recovered next day to proceed with the other members of the company.

A Novel Remedy for Hooping-Cough. — Dr. J. E. Wendel, of Murfreesboro, Tenn., writes as follows to the *American Practitioner*: "I was called three weeks ago to see a little white girl, seven years of age, who had had pertussis four weeks; had been coughing, hooping, and vomiting furiously. I visited her to see what injuries she had received in falling from the second to the first floor of the dwelling (fourteen feet) striking on her back on the floor. When I arrived she had recovered consciousness, but complained of some pain through the chest. The next day she was up and has been to this time, and seems to be entirely cured; coughs almost none at all; does not hoop any. Three or four other children in the same family, who contracted the disease at the same time, are still coughing, hooping, and vomiting. I do not recommend the remedy, but give it as one of the curiosities of my experience."

A Bad Case of Corns. — An exchange says that another paper states that "the corn of Mr. Redman, of Lycoming County, is two feet high." It adds, "We pity Redman. We cannot imagine how he gets his boots on over such a corn as that. Of course Redman cannot enjoy himself in hot weather. We hope Redman will never have a bunion. A man who grows such monster corns would certainly develop a bunion the size of a flour barrel."

A Warm Place. — The London *Chemist and Druggist* says: "A situation has lately been advertised in the following terms: 'A practical manager wanted for a sugar refinery. *Will have a boiler under him.* Must be a man of education, and experienced either in sugar refining or in chemical manufacturing. Salary £600 at first, which will be increased if qualifications warrant.' We hope the selected candidate has stipulated for a quarter's salary and a month's holiday in advance, as with that boiler under him the poor fellow will not much enjoy his £600 a year."

CINCHO-QUININE PREPARATIONS.

Dr. Charles A. Mosher, of West Troy, N. Y., sends the following as favorite prescriptions with him. The solutions are clear and very palatable. The citric acid is unobjectionable, and the formulæ are worthy of wide adoption.

Cincho-Quinine	1 drachm.
Simple syrup	4 ounces.
Sol. citric acid	2 drachms.

Reduce Cincho-Quinine to powder, add Syrup and transfer to bottle; add "Citric Acid," let it stand a few minutes, and the result will be a palatable clear mixture.

Elixir.

Cincho-Quinine	2 drachms.
Ess. orange,	
Tr. cochineal co., each	½ ounce.
Alcohol, 95 per cent.	4 ounces.
Cinnamon water,	
Simple syrup, each	6 ounces.
Sol. citric acid	½ ounce.

Mix as above.

Solution Citric Acid.

Citric acid	1 drachm.
Water	2 drachms.

SELECT FORMULÆ.

Application for Burns. — M. Lebigot recommends the following mixture as having been very successful: —

Cape aloes	4 ounces.
Water	10 ounces.
Alcohol (90°)	3 ounces.

The ingredients are to be melted together in a china plate over a slow fire, allowed to cool, and then filtered, after which three more ounces of alcohol are to be added. It is then ready for use. A tablespoonful of the mixture mixed with a teaspoonful of acetate of lead and twenty tablespoonfuls of water constitutes an excellent remedy. It is to be applied morning and evening on the burnt parts.

Topical Application in Painful Dentition. — The *Philadelphia Medical Times* gives this recipe: —

Syrup of tamarinds	2½ drachms.
Infusion of saffron	2 scruples.
Honey	2½ drachms.
Tinct. (essence) of vanilla	4 drops. Mix.

Rub gently over the gums with the finger or rag. An application of a similar character is the following: —

Saffron (powdered)	4 to 6 grs.
Honey	2 to 3 drachms.

Glycerine may be substituted for the honey.

To Render Cod-Liver Oil Tasteless. — Many formulæ for this purpose have been given, and the *Boston Medical and Surgical Journal* adds the following: —

Cod-liver oil	7 drachms.
Spt. lavand. comp.	1 drachm.
Brandy	1 " Mix.

Agreeable Purgative. — The following is commended by good authorities: —

Calcined magnesia	1½ drachms.
Water	2 ounces.
Syr. orgeat (or Curaçoa)	½ ounce. Mix.

Iodized Coffee. — Dr. Calvo, the elder, recommends an iodized syrup of coffee containing the following: —

Syrup of coffee	500 grammes.
Potassium iodide	16 "

Dose. — Two or three spoonfuls each day.

Syrup of coffee is excellent for disguising the taste of iodide of potassium, and makes the use of this valuable remedy agreeable to the sick.

Cincho-Quinine. — Messrs. Billings, Clapp, & Co. continue to receive hundreds of the most emphatic testimonials to the value of this agent from leading physicians in all parts of the country. A few of these may serve as samples of the whole.

Dr. John C. G. Robertson, of Paterson, N. J., writes, June 11th: "Cincho-Quinine I now use altogether in preference to any other preparation or combination."

Dr. J. Mackay, of Dallas, Texas, writes, June 22d: "Your Cincho-Quinine I have used with marked success. I prefer it in every way to the sulphate."

Dr. A. F. Reed, of Allenville, Missouri, under date of June 23, says: "I find it in every respect equal if not superior to the sulphate of quinia, especially with children. I had a case of bilious and remittent fever in a little boy two years of age. The fever was associated with gastric disturbance, and it was found impossible for the sulphate to be retained on the stomach; consequently I prescribed the cincho-quinine, which was retained, and the result was a rapid recovery."

Dr. I. Lewis Dorset, of Genito, Va., who has before borne witness on the subject, adds the following testimony under date of June 29th: "Since my last remittance to you I have used about two ounces of the Cincho-Quinine (for the same diseases for which the sulphate of quinia is usually administered), with the most satisfactory results. I like it even better than the quinia, as it does not affect the head so unpleasantly as the latter drug frequently does."

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Familiar Science.

THUNDERSTORMS, HURRICANES, AND TORNADOES.

THE present season of hot weather has in this country been unusually prolific of severe thunderstorms, deluges of rain, tornadoes, and other natural catastrophes of a terrific and destructive character. The fearful disaster in Nevada, in which the town of Eureka was almost destroyed by a deluge of water from a cloud which burst over the place, was speedily followed by the more awful thunderstorm at Pittsburg, Pa., in July. Beside the vast destruction of property, nearly two hundred lives were lost in both places, from these extraordinary occurrences. The attention of all readers has thus been forced in the direction of a class of natural phenomena to which we will give brief consideration.

It may be stated at the outset, that neither of the casualties alluded to can rightfully be classed as cyclones, hurricanes, or tornadoes. These terrible visitants are peculiar to tropical regions, and specially so to the eastern and western Indian oceans. The occurrence at Pittsburg was local, confined within quite narrow limits, and was doubtless due in part to the peculiar geographical formation of the country. The barometer within a few miles of the scene of the disaster was but little disturbed during its continuance, and no alarming meteorological changes were noticed by United States signal observers at any of the stations. It might perhaps be regarded as a "waterspout," giving to the term its popular significance; but more properly it was an extraordinary thunder gust, attended by a display of electrical excitement and a rainfall unparalleled in the meteorological history of the Northern or Middle States.

No class of phenomena is more appalling than that under consideration. The suddenness with which a terrible thunderstorm, hurricane, or tornado bursts upon a section of country leaves no time for deliberation, or for seeking places of safety. In fact, no place seems secure in such an hour, and the calmest minds are at a loss what to do. The darkness, the torrents of rain, the blinding electrical discharges, the howling winds, all conspire to exhibit danger in every direction. The rain at Pittsburg was not of the ordinary kind; the water came down in vast sheets, submerging and crushing dwellings, as the landslide or the avalanche overwhelms the homes of the Swiss peasants on the sides of the mountains.

Six years ago, on the 29th of October, St. Thomas, in the West Indies, was visited by a hurricane of terrible violence. The harbor was full of shipping, and at the hour of nine in the forenoon the weather was fine, and the barometer stood at 30 inches; within half an hour the barometer had fallen seven tenths of an inch, and the hurricane commenced. At noon, the barometer showed a pressure of only 28 inches, and the town was in the midst of a tornado most appalling. The sky was then black, and the darkness so thick that nothing could be seen either of cloud or sky. Deluges of rain descended, hailstones consisting of angular fragments of ice fell, earthquake shocks were felt, huge sea waves swept over the earth. At this time the central axis of the storm passed over the town, and the scene was fearful. By five P. M., the storm having lasted eight hours, all was over; nearly every ship was wrecked, every building injured or destroyed, and a large part of the population ruined. Notwithstanding the long-continued and extreme violence of this tornado, a less number of lives was lost, than at Pittsburg in July. Only about 100 perished, while at Pittsburg 140 lives were sacrificed. Terrible and fatal as was this storm at St. Thomas, it was far less destructive to human life than many that have occurred in the West Indian seas. The great hurricane of 1780 destroyed six thousand persons at Santa Lucia, five thousand at St. Eustatia, and ten thousand at Martinique. Part of this great mortality was due to an earthquake at the time, and part to the huge sea waves which rolled over the towns. Hurricanes of this severe nature rarely visit our northern shores. They take their start generally from the islands nearest the northeastern corner of South America, and travel in a tolerably regular and almost parabolic curve, first to the northwest, then past the coast of Florida towards the north, and afterwards bearing more to the east, parallel to our coast, emerge again on the Atlantic near the banks of Newfoundland. They travel at rates varying from two to seven hundred miles per day, for a distance sometimes exceeding four thousand miles. They have a limited breadth of from one to four hundred miles, and within the limits of their path they move with so much system and regularity that with a few data we may almost tell, by calculation, the exact details of their course.

Our violent northeast storms are largely due to the disturbance which these hurricanes make in our atmosphere when passing up the coast. These storms are really whirlwinds on an immense scale, of which we have striking examples in the little rotating currents which on a summer's day are seen to raise clouds of dust, mingled with leaves and twigs, and whirl them round and round through the air. The great whirlwinds twist round with a fearful rapidity on a central axis, where there is generally a calm, the belt of storm moving steadily at the same time along the surface.

Water-spouts at sea, and sand-storms in the deserts of Africa, are similar phenomena. It is easy to understand how they originate. The excessive heating of the earth in some special localities near the equator would cause currents of air to rush in to fill the partial vacuum thus formed. As the cooler currents met the hot air they would become specifically lighter, and ascend; at the same time they would take on a spiral motion by travelling not across but around the heated space. In this way a region of calm is formed in the centre, and it is at this point that the most intense electrical excitement occurs. The mechanical force exerted by wind thus set in motion is vast indeed. The partial vacuum in the central part, where the pressure is reduced from 100 to 150 pounds on each square foot, acts in the most extraordinary manner on buildings, not unfrequently forcing the windows and roof outwards, instead of blowing them into the building, and sometimes lifting a whole building from its foundations.

The blinding flashes of electrical light, which are incessant in some portions of a *cyclone* (for we must give this name to all violent storms in which the wind moves round an axis, in a circle, or rather spiral) are due to the rapid condensation of aqueous vapor in the atmosphere. When this process of condensation occurs, it is attended by electrical phenomena. If an engineer raises the valves connected with his steam boiler, and allows the steam to escape, condensation occurs, and simultaneously electrical excitement results. So with the clouds which are formed from this condensed moisture; they are electrically charged, and when the tension becomes too great, a discharge takes place, and light is produced.

The quantity of water which falls from the clouds in cyclones and thunderstorms is a feature of this class of phenomena which awakens perhaps the most wonder. From whence come these mighty rivers of water which so suddenly drop from above? At Pittsburg the quantity of water which fell in the space of twenty minutes was so great that streets, cellars, houses, were filled with it, and dwellings which stood on firm foundations were in a few moments lifted by the flood and floated away, borne on by a mighty torrent. It is difficult to understand or comprehend the fact that the atmosphere continually holds in its embrace an amount of water sufficient to destroy the whole face of nature, if the little particles of vapor should unite and descend to the earth. This water in the atmosphere may well be made the theme of an entire article, and we can refer to it but briefly at the present time. The aqueous vapor is around us everywhere, not only in times of storm and tempest but when the sun shines brightest and all is calm and beautiful. It is only necessary for sudden changes of temperature to occur in the atmosphere, and floods of water descend upon the earth. The amount of water which is formed depends upon conditions of temperature, and the suddenness with which favoring influences are brought into play. At Pittsburg, we are told that two clouds met, coming from different points, and both discharged their contents simultaneously. This means that there were two distinct areas of clouds, where condensation was proceeding rap-

idly, and thus the work of ruin was accomplished by the joint action of the two. The conditions were certainly favorable for the rapid condensation of atmospheric moisture, and a deluge resulted. We are not to suppose that these storms are mere *accidents;* they are, like most natural phenomena, simple results of certain great laws that may be studied and understood. The forces that are in action to produce ordinary winds and rains tend from time to time to produce these extraordinary tempests also. We cannot well avoid or escape from them; we exist under and by the laws of nature, and when there occurs a sudden exaggeration or concentration of the forces of nature so that evils result, we must not regard the circumstance as involving any special exercise of the Divine Will.

CONCERNING SULPHUR.

In 1683 there was a violent eruption from Mount Etna, in Sicily, which was attended with an earthquake, whereby 60,000 persons were destroyed. The sulphur which is now sold in the markets of the world is said to be largely derived from veins produced on that memorable occasion. The sulphur is ejected from the volcanoes at the time of their activity, and fills up vacant spaces in the lava or frothy pumice-stone. When this is quarried or mined, and dug out, it forms the brimstone of commerce. When this brimstone is melted and cast into sticks, it produces the roll sulphur of the shops; and when the brimstone is boiled, and its vapor is allowed to escape into an air-tight chamber, the variety called flowers of sulphur is the result. Sulphur in its natural state is found only in volcanic regions; but in combination there is scarcely any substance so universally diffused over the world. It is found not only united with all kinds of metals on the face of the earth, but also in plants and animals, and is of so much importance to these that they cannot exist without it. The exquisite perfume of wall-flowers is a peculiar compound of sulphur. If a silver spoon be left in an egg, it soon becomes black; that effect is caused by the sulphur of the egg uniting with the metal. A compound of sulphur is always present in the air we breathe; and although small in proportion to its other constituents, yet the air is never free from it.

Commercially speaking, sulphur rules the destiny of man both in the arts of peace and in the appliances of war. It is the key which opens the door to the most important chemical manufactures. From it we make sulphuric acid, or oil of vitriol, which has well been called "the king of the acids." By its aid we are enabled to produce so many substances that the bare mention of them would fill the whole of this paper. Bleaching, dyeing, soda-making, metal-refining, electro-plating, and electric-telegraphing are primarily indebted to this acid. Many of the most valued medicines, such as ether, calomel, etc., could not be made without it. Sulphur being the chief ingredient of gunpowder, all the applications of that explosive in war and peace are dependent upon it. A people that does not possess lucifer matches stands beyond the pale of civilization, yet matches cannot be made without sulphur; not because matches are dipped into melted brimstone before they are tipped with the phosphoric composition which ignites them, but because this very material could not be made without the indirect use of sulphur. England alone consumes more than 60,000 tons of sulphur annually, which is all brought from the volcanic regions of Sicily.

A paragraph has lately been going the rounds of the papers in which it is stated, on the authority of Signor Parodi (who ought to know all about it), that the sulphur in Sicily will be exhausted in from fifty to sixty years; but Mr. W. Shelford, in a communication to the *Journal of the Society of Arts* for July 10, 1874, gives good reasons for doubting the accuracy of this estimate. Mr. Shelford has inspected very many sulphur mines in the island, has visited most of the sulphur districts, and has been engaged for some years in directing the working of mines there. He says that, with very few exceptions, the ore is carried to the surface on the backs of boys, two to four of whom accompany each miner, and it is a well-known fact that the produce of a mine in Sicily is chiefly determined by the difficulty of getting boys. Moreover, as each boy carries a small load only, and makes several journeys per day up and down the difficult headings and shafts, the mines soon reach a depth at which they cease to be profitably worked. This depth is in practice found to be about four hundred feet, below which winding machinery is needed for hauling the ore to the surface, but has hitherto scarcely been tried. All the sulphur in the island, therefore, below four hundred feet, is almost untouched. That this quantity is considerable may be inferred from the fact that many of the beds of ore are nearly vertical, and improve as they descend.

GREEK CURRANTS AND ENGLISH PLUM PUDDINGS.

The currant takes its name from Corinth, but the Greek currant is a diminutive kind of grape, of no close botanical relationship to our acid garden fruit of the same name, which was so called merely on account of its external resemblance to the currant proper. Several other fruits owe their names to the localities where they were first found or where they grow in the greatest perfection, as the *peach* from *Persia* and the *damson* from *Damascus;* but these have been introduced into many other countries where they flourish as well as in their original *habitat.* The currant, on the other hand, remains to this day an exclusively Corinthian or Greek product, all attempts to naturalize the vine in other lands having failed. In Sicily and Malaga it degenerated into the common grape, and in Spain it would not grow at all, though the climate of these regions was similar to that of Greece, and the other conditions were apparently favorable to the success of the experiment.

The currant is not only confined to Greece, but it is, commercially, the most important product of the country. The foreign trade, indeed, depends almost entirely upon this one crop, and the increase in the yield is counted as the most accurate indication of national progress. According to the last official reports there were more than 50,000 acres under currant cultivation, and the crop in 1872 was reckoned at 82,000 tons, valued at about ten millions of dollars. About three fourths of the whole, or 60,000 tons, went to Great Britain, where it is mainly used in furnishing the plums for the puddings of which John Bull is so voracious a consumer. The single fact that he pays £1,557,000 (nearly $8,000,000) for a year's supply of these plums is sufficient proof that this traditional fondness for plum pudding is as truly a national trait as the love for roast beef with which it is familiarly coupled. And the demand for the fruit in England is continually on the increase, especially since the reduction in the duties. No wonder that the Greeks consider the English as "a nation of pudding-eaters," and pray that they may long continue to be so.

The growth of the currant vine extends along the northern coasts of the Peloponnesus up to Corinth, but seldom above two or three miles inland; upon the continent, in the district around Missolonghi, and in the islands of Cephalonia, Corfu, and Zante; but the portions best adapted for the cultivation are the southern shores of the Gulfs of Patras and Corinth, these localities being less subject to storms and heavy night dews. The vine is of a dwarf description and delicate nature, requiring much care and attention during its growth; the plants, which grow low, are supported with sticks, and several years must elapse before the yield is remunerative. In the autumn the earth is loosened and gathered up in small heaps until the pruning time in spring, when it is again laid down smooth around the roots of each plant. Women and children are largely employed; in the vineyards they carry away the cuttings of the vine, take manure to the plants, collect the stones when necessary, break off the tops of the shoots and the leaves, to give the fruit more sun, collect it, and in some places they dig the ground. The system known as "ring-cutting," or peeling off the vines while they are in blossom, is greatly practised. This is considered to aid the secretion of a portion of the sap of the tree in the young forming berry, producing a heavier and more delicate fruit, with a thinner skin. During harvest many hired laborers are engaged, who move about from one district to another. The crops are liable to injury in the spring from the blight, and rainy weather in the harvest season produces great mischief. The gathering takes place about August and September, and the time required for drying the currants is a fortnight to three weeks, according to the state of the weather.

The returns yielded by currants are very uncertain. Whenever, owing to a severe winter, or the lateness of the rainfall, the crop is backward in ripening, it rarely happens that it is got in undamaged. During the month of August thunderstorms with heavy falls of rain invariably occur in this climate, and should the fruit then happen to be on the vines, and especially should it be exposed on the drying areas, it must suffer. It often occurs that on such occasions the crop is partially damaged, and sometimes when fermented it is entirely lost. The vines are subject to attacks of the oïdium, which first made its appearance in 1852 and 1853. Even now this blight is kept out only by the repeated use of sulphur during the vegetation of the plants, and by powdering the leaves with it two or three times during the growth. The quality of the currant is judged by size and color, which should be of a purplish blue. The red berries are either unripe, or else the produce of young vines. The vine itself is said not to yield profitably after seven years' growth. The Greek government, although sorely in need of funds

levies no export duty upon the currant, but there is a tithe or tax upon their production, which, for facility of collection, is taken at the custom house.

HOW TO TAKE CARE OF CHINA AND GLASS WARE.

In the average household few things suffer more from ill usage than porcelain and glass, especially the finer kinds of such ware. A few practical suggestions on the best methods of cleansing and preserving these fragile materials may be welcome to the readers of the JOURNAL.

One of the most important things is to "season" glass and china to sudden change of temperature, so that they will remain sound after exposure to sudden heat and cold. This is best done by placing the articles in cold water, which must gradually be brought to the boiling point, and then allowed to cool very slowly, taking several hours to do it. The commoner the materials, the more care in this respect is required. The very best glass and china is always well seasoned, or "annealed," as the manufacturers say, before it is sold. If the wares are properly seasoned in this way, they may be washed in boiling water without fear of fracture, except in frosty weather, when, even with the best annealed wares, care must be taken not to place them suddenly in too hot water. All china that has any gilding upon it must on no account be rubbed with a cloth of any kind, but merely rinsed first in hot, and afterwards in cold water, and then left to drain till dry. If the gilding is very dull and requires polishing, it may now and then be rubbed with a soft wash-leather and a little dry whiting; but this operation must not be repeated more than once a year, otherwise the gold will most certainly be rubbed off and the china spoilt. When the plates, etc., are put away in the china closet, pieces of paper should be placed between them to prevent scratches on the glaze or painting, as the bottom of all ware has little particles of sand adhering to it, picked up from the oven wherein it was glazed. The china closet should be in a dry situation, as a damp closet will soon tarnish the gilding of the best crockery.

In a common dinner service it is a great evil to make the plates too hot, as it invariably cracks the glaze on the surface, if not the plate itself. We all know the result — it comes apart; "nobody broke it," "it was cracked before," or "cracked a long time ago." The fact is, that when the glaze is injured, every time the "things" are washed the water gets to the interior, swells the porous clay, and makes the whole fabric rotten. In this condition they will also absorb grease; and when exposed to further heat the grease makes the dishes brown and discolored. If an old, ill-used dish be made very hot indeed, a teaspoonful of fat will be seen to exude from the minute fissures upon its surface. These latter remarks apply more particularly to common wares.

As a rule, warm water and a soft cloth are all that is required to keep glass in good condition; but water bottles and wine decanters, in order to keep them bright, must be rinsed out with a little muriatic acid, which is the best substance for removing the "fur" which collects in them. This acid is far better than ashes, sand, or shot; for the ashes and sand scratch the glass, and if any shot is left in by accident the lead is poisonous.

Richly cut glass must be cleaned and polished with a soft brush, upon which a very little fine chalk or whiting is put; by this means the lustre and brilliancy are preserved.

FRENCH SCIENTIFIC NOTES.

CONDENSATION OF GASES IN THE GERMINATION OF SEEDS. — Further researches with regard to germination have been made by Deherain and Landrin, who report the results in the *Comptes Rendus*. They consider that they have fully demonstrated that gases are condensed by germinating seeds, since they have found (1) that a small quantity of free nitrogen is present in them; (2) that this gas is liberated in long-continued experiments; and (3) that a diminution of volume occurs in the air during the first period of germination if the process takes place in a closed vessel. This last fact is the most significant of the three. Of course the rapid condensation of from ten to fifteen times its bulk of gas by a seed cannot occur without a loss of latent heat on the part of the gas; and it is precisely this heat which raises the temperature of the occluded oxygen to a degree sufficient for the phenomenon of oxidation to begin. The agitation is communicated to the whole mass, and the heat liberated by the combination favors a new action, manifested by liberation of carbonic acid.

ABSENCE OF OXYGEN IN THE WATER OF ARTESIAN WELLS. — M. Gérardin, in a paper read to the Paris Academy of Sciences descriptive of the artesian wells of Grenelle, states that there is no free oxygen present in the water from the lower sandstone of this locality, nor from the Rilly gravel beneath the clay and in contact with the chalk (the water was obtained out of contact with air from various depths by means of a siphon), nor from the Soissonais gravel. Neither was this gas discovered in the water from the artesian well at Gonesse. M. Gérardin concludes that water obtained from subterranean depths does not contain oxygen if kept from contact with the atmosphere. This precaution is essential, for in contact with air it dissolves several cubic centimetres of oxygen. The author has often found in the interior of the ascension tubes long white opaline filamentary algæ. These algæ present the curious property that they remain white in solar light as long as the water is deprived of oxygen; but they become green the instant the water is the least aerated. Their sensibility to the action of oxygen is most delicate. The action of the algæ serves to confirm the chemical test with hyposulphite of soda.

CHLOROFORM VS. PETROLEUM. — According to the same journal, the addition of one part of chloroform to five of petroleum renders the latter incapable of combustion until the former has evaporated. In an experiment, a litre of burning petroleum spread out over a surface of ten square centimetres was extinguished by throwing upon it fifty cubic centimetres of chloroform.

DETECTION OF ARSENIC IN WALL-PAPERS. — Hager, in *Les Mondes*, recommends this method for the detection of arsenic in paper-hangings. A slip of the paper is steeped in a concentrated solution of nitrate of soda in a mixture of equal parts of alcohol and water, and allowed to dry. It is then burned in a porcelain capsule, water is poured upon the ash, an excess of potash is added, and the whole is boiled and filtered. Dilute sulphuric acid is added to the filtrate, and then permanganate of potash, which is dropped in slowly till the red color disappears, giving place to a yellow under the influence of heat. If the liquid is turbid, it is filtered afresh. It is then cooled, placed in a bottle, more sulphuric acid is added, as also a small piece of pure zinc, and the bottle is closed with a stopper having two slits. In one of these is placed a piece of paper steeped in nitrate of silver, and in the other a slip of parchment soaked in sugar of lead. If arsenic is present, the former speedily blackens. The parchment serves merely for the detection of sugar of lead.

BLEACHING BONES AND IVORY. — M. Cloez states that this is best accomplished by exposing the materials to sunlight for three or four days, in vessels filled with oil of turpentine. The articles should be placed on zinc supports a little above the bottom of the vessels.

CLEANSING BOTTLES WITH FRAGMENTS OF IRON. — Attention has repeatedly been called to the danger of cleansing bottles with shot, as is commonly done, many cases of lead poisoning having been caused by stray shot left after the process. M. Fordos, in the *Comptes Rendus*, advocates the use of clippings of iron wire instead of the shot. They are easily got, and clean the bottles quicker and better than lead does. The iron is attacked by oxygen, but the oxide does not cling to the glass and is easily removed by rinsing. In cases where even the minute trace of iron left behind would be objectionable, clippings of tin may be used.

CULINARY HINTS.

COOKING CAULIFLOWER. — The following recipes are from an English source: —

1. *Stewed.* Cut up the cauliflower into sprigs of convenient size for serving with a tablespoon, and throw them into cold water an hour before cooking. Put a lump of butter into a porcelain-lined stewpan over a gentle fire. As it melts, stir into it an onion chopped very fine, and a little flour and water; continue stirring until the whole is nicely browned. Then put in the cauliflower, adding only just enough water or broth to cook it; season lightly with pepper and salt, and a touch of grated nutmeg if you like it. Let it stew gently until perfectly tender. When done the gravy should be so reduced as to be no more in quantity than is wanted for serving as sauce with the vegetable. Transfer the cauliflower from the stewpan to a hot dish, and pour the reduced gravy over it.

Note that by this method nothing is lost. The nutritive juices of the vegetable, the sugar and albumen, are retained, instead of being drawn out by boiling in a large quantity of water, which is afterwards thrown away.

2. *Browned, or au Gratin.* Divide the heads into sprigs as before; throw them into a saucepan containing just enough boiling water to cover them, with a teaspoonful of salt in it; boil them galloping till tender, to be ascertained by taking out a sprig with a fork and tasting it; turn them out into a cullender to drain for a few minutes, then reverse them from the cullender on to the dish on which they are to be served; pour over them a small quantity either of the brown sauce described above, or of good English melted butter, or of butter melted and made quite hot; sprinkle over them biscuit raspings and grated cheese; set the dish in a briskish oven or under a smart red-hot salamander; when the surface is nicely and evenly browned, send to table. Yesterday's cold cauliflower can be warmed in a little butter or sauce, and reappear to-day, renovated, *au gratin*.

A GOOD SALAD. — A correspondent of *The Gardener's Chronicle* says: "Here is a salad that will delight those who eat cucumber with bread and cheese: Take a tomato, not over-ripe, and cut it into slices, as you would a cucumber; take a small onion, and cut it up as fine as you can, sprinkle it over the tomato slices, add salt, pepper, and vinegar at discretion, and you will have a salad which, as a relish, puts the cucumber to shame."

Practical Chemistry and the Arts.

THE ACTION OF AMMONIA ON VARNISH.

It would appear from recent investigations that carriage builders have often been unjustly blamed for the deterioration of varnish on vehicles, when the trouble was really due to the action of ammonia in the air. There have been several interesting articles on this subject in *The Hub*, the leading journal in the country devoted to the carriage trade, and we believe we shall do many of our readers good service by a concise statement of the main facts in the case.

Every one knows that oils when brought in contact with alkalies are more or less readily converted into soaps soluble in water. Among the most easily saponified oils is linseed, which, when shaken up with a solution of potash, soda, or ammonia, unites with the alkali, forming a thick emulsion of soft soap. It is also a familiar fact that ammonia is a gas always present in the air, especially wherever organic decay is going on, as in barn-yards and stables. If a varnished carriage is exposed to this gaseous ammonia arising from manure heaps or decaying vegetable matter, the alkali combines with the oil of the varnish, forming an almost imperceptible film of soap. When the vehicle is washed this is dissolved and removed, leaving a fresh surface to be again acted upon by the ammonia. The oil being thus gradually removed, the varnish becomes brittle and more liable to crack. It is found that this cracking is most common on the upper surfaces and projecting parts of the carriage; probably, as an accomplished chemist who has looked into the matter suggests, because these parts "are most subjected to the influence of the ammonia by the falling on them of particles of dust impregnated with the gas."

The obvious "moral" is that varnished carriages should not be kept in a stable, nor in a building where vegetables liable to decay are stored. A friend has told us of a case in which the varnish on the back part of a carriage was found to be badly damaged, while on other portions it was comparatively uninjured. This was a mystery until it was observed that some potatoes in a barrel standing in the rear of the vehicle were partially decayed. The mischief was doubtless caused by the ammonia evolved from this source. It is no uncommon thing for farmers to keep vegetables in a carriage-house, but it will be seen that the varnish may suffer for it, if the vegetables happen to decay. In any place where elegant carriages are kept, nothing should be allowed that can possibly give rise to ammoniacal vapors.

NEW METHOD OF COLORING METALS.

Metals may be colored quickly and cheaply by forming on their surface a thin film of a sulphide. In five minutes brass articles may be coated with any color, varying from gold to copper red, then to carmine, dark red, and from light aniline blue to a blue-white, like sulphide of lead, and at last a reddish white, according to the thickness of the coat, which depends on the length of time the metal remains in the solution used. The colors possess a very good lustre, and if the articles to be colored have been previously cleaned thoroughly by means of acids and alkalies, they adhere so firmly that they may be operated upon by the polishing steel.

To prepare the solution dissolve 1½ ounces of hyposulphite of soda in 1 pound of water, and add 1½ ounces of acetate of lead dissolved in ½ pound of water. When this clear solution is heated to from 190 to 210 degrees F., it decomposes slowly and precipitates sulphide of lead in brown flakes. If metal is now present, a part of the sulphide of lead is deposited thereon, and, according to the thickness of the deposited sulphide of lead the above colors are produced. To produce an even coloring the articles must be evenly heated. Iron treated with this solution takes a steel-blue color; zinc, a brown color; in the case of copper objects, the first gold color does not appear.

If, instead of the acetate of lead, an equal weight of sulphuric acid is added to the hyposulphite of soda, and the process carried on as before, the brass is covered with a very beautiful red, which is followed by a green (which is not in the first-mentioned scale of colors), and changes finally to a splendid brown with green and red iris-glitter. This last is a very durable coating, and may find special attention in manufactures, especially as some of the others are not very permanent.

Very beautiful marble designs can be produced by using a lead solution thickened with gum tragacanth, on brass which has been heated to 210 degrees F., and is afterwards treated by the usual solution of sulphide of lead. The solution may be used several times.

LABORATORY NOTES.

The Manufacture of Oxygen Gas. — Up to the present time the chlorate of potash remains the most convenient material for the preparation of oxygen, and with a few precautions it is so free from danger or trouble that a large quantity of pure gas can be prepared in a short time. Instead of mixing it with binoxide of manganese or oxide of copper, to cause it to decompose more easily, and at a lower temperature, J. Loewe has for a long time employed freshly ignited oxide of iron (*caput mortuum*), which he mixes intimately with the chlorate in nearly equal parts by weight. He finds an advantage in previously melting the chlorate of potash, and when cold and hard rubbing it up with the oxide of iron.*

In the first place, both substances are free from moisture and less dangerous for generating gas; and in the second place, they are more compact, and hence take less room while conducting heat better, so that the gas is given off soon and is set free regularly at a lower temperature. The presence of moisture has another disadvantage, that before oxygen begins to be liberated a portion of the mixture flies off as dust, and is carried into the neck of the retort, and even into the connecting tube. For developing the gas, unless the quantity required is very large, he employs a plain glass retort, over the neck of which he draws a piece of rubber tubing half a metre long, to conduct the gas where desired. A thin clay lid, perforated with holes and resting on a tripod, is placed under the retort instead of a wire gauze or sand-bath. A clay cylinder open at both ends surrounds the retort, concentrating the heat and serving as a support instead of a retort-holder, as well as preventing a sudden cooling of the retort at the close of the operation. A Bunsen burner furnishes sufficient heat. If the operation is suspended before all the material is exhausted, the portion of the mixture still undecomposed is easily separated from the decomposed part, which is matted together, by gently tapping and pouring out, and may be kept for use the next time. On soaking out the mass, which adheres to the retort, with hot water, the oxide of iron is recovered, to be used a second time.

* For ourselves, we dislike the dangerous operation of pulverizing this explosive substance when mixed with anything else.

To Distinguish the Materials in Mixed Fabrics. — A German scientific journal gives the following treatment for fabrics containing silk and wool, with vegetable fibres. All vegetable fibres resist caustic alkaline solutions even when boiling, and are dissolved by sulphuric, nitric, and hydrochloric acids, even diluted, with heat. Vegetable fibres, when burnt, do not give forth any characteristic odor. Wool, insoluble in the above acids, is readily attacked by caustic alkalies, especially when hot; the sulphur which it contains combines with the alkali, and the solution becomes black when acetate of lead is added to it. In burning, wool produces the same smell as horn. Silk is dissolved both in the acids and the caustic alkalies, and produces an odor similar to that of wool, but it contains no sulphur, and, consequently, its solution in alkalies is not blackened by acetate of lead. In order to distinguish these materials in a tissue, it is treated first with concentrated hydrochloric acid, cold; the residue is then washed in a filter, and if necessary bleached by means of water containing chlorine, and then washed again in pure water and boiled with caustic soda, which dissolves the wool, leaving the vegetable fibre intact. The wool is distinguished from silk by adding acetate of lead to the liquid, as already mentioned.

MEMORANDA IN THE ARTS.

New Paper Materials. — At the Vienna Exhibition there were specimens of paper made from several materials which have not hitherto been utilized for that purpose. Among these was paper from the mulberry-tree bark, from the stinging nettle, and from potato stalks. In sections of European countries where mulberry leaves are used for feeding silk-worms, the remaining twigs have served only for fuel. But now, in Austria and parts of Italy, the bark is peeled off by a very simple arrangement, and from it a material prepared from which a good quality of paper is made. In Hungary the nettle is used with rags for making fine sketching and copying paper, and in Bohemia wrapping paper is made from potato stalks.

Disintegration of Tin. — We have before referred to cases of the disintegration of tin under the combined influence of cold and continuous vibration. Another instance of the kind has lately been described by M. Oudemans. A manufacturing house in Rotterdam despatched for Moscow last winter a certain quantity of tin, in the ordinary form of blocks. The metal, conveyed by railway in very cold weather, reached its destination in the form of a powder of large crystalline grains. It had a gray color, quite different from that generally presented by tin. Chemical analysis showed that the metal was almost quite pure; containing at the most 0.3 per cent. of foreign substances (lead and iron).

Large Gas-Holders. — English journals state that a Glasgow firm is now making four telescopic gas-holders for the Gas Light and Coke Company of London. Two of these holders are the largest that have hitherto been made in Glasgow. They are intended to be put up at the Beckton station, and are each 180 ft. diameter by 61½ ft. high, and when full, will contain about 1,600,000 cubic feet of gas each. The other two are for the Bow Common station, and measure 164½ ft. diameter by 70 ft. high, and will each contain about 1,500,000 cubic feet of gas. Each of the holders has a guide framing of 24 cast-iron ornamental columns, about 70 ft. high, bound together by ties of wrought-iron lattice girders. The total weight of cast and wrought iron in each gas-holder will be about 900 tons.

M. Werdermann's Process for Resharpening Files. — Well-worn files are first carefully cleaned with hot water and soda; they are then placed in connection with the positive pole of a bat-

tery, in a bath composed of 40 parts of sulphuric acid, 80 parts of nitric acid, and 1000 parts of water. The negative pole is formed of a copper spiral surrounding the files, but not touching them; the coil terminates in a wire which rises towards the surface. This arrangement is the result of practical experience. When the files have been in the bath ten minutes, they are taken out, washed, and dried, when the whole of the hollows will be found to have been attacked in a very sensible manner; but should the effect not be sufficient, they are replaced in the bath for the same period as before. Sometimes two operations are necessary, but seldom more. The files, thus treated, are to all appearance like new ones, and are said to be good for 60 hours' work. M. Werdermann employs twelve medium Bunsen elements for his batteries.

A Very Simple Pantograph. — Schnaus suggests the use of a fine rubber cord, about 15 in. long, supplied with a loop at each end, and having on it a small white bead, sliding upon it with gentle friction. By securing one end to the table by a pin and passing a pencil through the other end, and drawing its point over the paper with the right hand, keeping the string stretched, and causing the bead to describe the outline of a simple drawing placed beneath it, a tolerably good copy of the drawing will be produced, bearing any desired proportion to the original, according to the position given to the bead on the string; thus, if the bead is in the centre of the cord, the drawing will be double the size of the original. The best results are only obtainable after some practice, and by employing a finer point than a bead.

PRACTICAL RECIPES.

Black Walnut Stain. — Take 1 lb. of logwood chips, ½ lb. of red sanders, ½ gallon of water. Boil over a fire until the full strength is obtained. Apply the mixture, while hot, to the wood, with a brush. Use one or two coats to obtain a strong, red color. Then take 1 gallon of spirits of turpentine, and 2 lbs. of asphaltum. Dissolve in an iron kettle on a stove, stirring constantly. Apply, with a brush, over the red stain, to imitate rosewood. To make a perfect black, add a little lampblack. The addition of a small quantity of varnish with the turpentine will improve it. This stain, applied to birch-wood, gives as good an imitation of rosewood as on black walnut, the shade on the birch being a little brighter.

Purple Stain. — Take 1 lb. of logwood chips, ¾ gallon of water, 4 oz. pearlash, 2 oz. powdered indigo. Boil the logwood in the water till the full strength is obtained, then add the pearlash and indigo, and when the ingredients are dissolved, the mixture is ready for use, either warm or cold. This gives a beautiful purple.

For Polishing Pearl. — Add olive oil to finely pulverized rotten stone, so as to make a thick paste. Then add sulphuric acid in sufficient quantity to make a thin paste. Apply this paste and rub quickly with a cork covered with velvet, and, as soon as the pearl takes the polish, wash off. This is a fine polish.

Cabinet-Maker's and Turner's Cement. — Take 1 oz. beeswax, ½ oz. resin, ½ oz. pitch. When these are melted, stir in very fine brick-dust. This is a strong cement.

A Good Writing Ink. — The *Moniteur des Produits Chimiques* gives this recipe for an ink which will neither become thick nor mould: Digest for twenty-four hours with gentle heat 250 grammes powdered nutgalls with half a litre of alcohol of 82°; and in another vessel 90 grammes ferrous sulphate and 90 grammes gum arabic with half a litre of distilled water. Mix the two liquids slowly, allow to stand for eight days, strain, and add three or four drops of vanadic acid.

Agriculture.

LAWNS.

The most beautiful object in town or country, connected with dwellings, is a rich, velvety lawn, kept in good condition. Unfortunately, our country or climate is not well adapted to the preservation of lawns in their highest perfection as we see them in England. Our summers are usually hot and dry, and the winters bring frosts so severe that rich turf is displaced, and the roots of grasses destroyed. We can, however, manage to overcome the disadvantages of winter more easily than those of summer, as nothing can prevent the destructive influence of the fierce rays of the sun, and nothing can supply the want of rain. During the summer of 1873 no rain fell in the New England States from June 23 to July 24, and the rich and costly lawns connected with suburban residences near this city were burned to a crisp. The sight was so melancholy that pleasure-riding for a time in a large measure ceased, and the fine drives around the city were comparatively deserted.

Lawns are occasionally injured in England by drought. The season of 1870 was specially severe. All over England the eye rested upon brown fields; and Hyde Park, Battersea, Bushy Park, and other lovely rural retreats around London, lost their deep green, and were for a few weeks unattractive. This, however, was an exceptional season, and one like it may not occur for a dozen years.

It is possible in the country to do much to preserve lawns in good condition. The ground should be under-drained, deeply pulverized, and thoroughly manured, before the seed is sown. If the land is naturally dry, underground drains aid in mitigating the effects of drought. The currents of moist air which are allowed to circulate through them in the heat of summer assist materially in affording sustenance to grasses. If any one desires to prepare a lawn and maintain it in the best possible condition, the preliminary work cannot be slighted.

During the present season we have laid down as a lawn about two and a half acres of ground, and shall add to it the present autumn about three acres more. The land was a pasture at the farm, upon Midlake Hill, where a stone dwelling has just been erected. It was deeply ploughed in the autumn of 1873, and during the past spring it was thoroughly pulverized by repeated cross-harrowings. After the ground was fully prepared, and fertilized with concentrated fertilizers, the seed was sown, consisting of a mixture of white clover, red-top, and timothy. The timothy in small quantity is an important addition to the seed, as it affords strong roots, and seems to protect the more tender grasses until they are vigorous enough to be self-sustaining.

The seed was sown on the 26th of April, and on the 19th of July a crop of succulent grass was cut, which, when dry, gave more than a ton to the acre. In the first cutting of lawn grass, much good judgment must be exercised. It will not answer to cut it too early, as the branching young leaves are needed to shelter the tender roots from the hot sun, and on the other hand it is injurious to allow it to become too thick and matted, as the shade and confined air kill the roots. In some cases it is undoubtedly well to sow with the grass seeds oats or summer rye, but we prefer the unmixed grass seeds if they can be sown early in the season. Our lawn is now in a fine condition of luxuriance, and with care, we hope to maintain it in a satisfactory condition if the seasons are moderately favorable.

EXPERIMENTS IN THE FEEDING OF ANIMALS.

The German agricultural chemists have especially distinguished themselves by investigations in animal chemistry, in both its scientific and practical relations. In the latter direction they have carefully determined the digestibility of the constituents of ordinary food, the variations of this digestibility with different classes of animals, and the manner in which the proportion digested is influenced by the presence of other substances. The London *Agricultural Gazette* reports at length the results of some of the most interesting of these researches, a concise abstract of which may be of interest and service to some of our readers.

The practical experience of every stock-feeder has probably taught him that green fodder is more nutritive than hay. Green crops are fed or cut for fodder in all stages of their growth, the mowing or pasturing being entirely regulated by the requirements of the stock. Hay, on the other hand, is never made till the green crop has reached the point of its maximum growth. Thus an animal fed on green food generally consumes the forage plant in a younger and less mature condition than when it feeds on the same plant in the form of hay. Now chemists have shown that the difference in the age of a plant generally implies a considerable difference in its composition, and that with fodder crops there is a rapid increase of hard vegetable fibre as the plant approaches maturity, and a corresponding decrease of albuminoids (muscle-formers), and of sugar and other soluble matters. This may be illustrated by analyses of two samples of lucerne taken from the same field in the early part of June, one eleven days later than the other. The analyses refer to the perfectly dry plant.

	Earlier Sample.	Later Sample.
Albuminoids	18.31	17.81
Fat	3.18	2.37
Extractive matter	43.02	39.46
Woody fibre	25.84	32.39
Ash	9.65	7.97

These figures show sufficiently what an important change in the composition of a fodder crop may take place even in eleven days. The practical lesson from these facts is that crops intended for hay should be cut as soon as blossoming has fairly set in. To allow the blossom to get old before cutting is to pass the period at which the maximum amount of digestible food is obtainable.

Green fodder and hay can only be fairly compared when both are obtained from a crop of the same age. Professor Kuhn has conducted two series of experiments on this principle, the earlier experiments with red clover, the later with lucerne. We will limit ourselves to a brief account of the former. Two oxen were gradually brought to a diet consisting of green clover

only ; they each received 100 lbs. per day. As soon as the clover in the field came into bloom the scientific part of the experiment began, and hay was made each day in the field. At the end of fifteen days the feeding with green clover was stopped, and the same oxen then received the hay which had been made at the time that the green food was cut, the quantity of hay given to each ox being regulated so as to contain the same weight of dry matter as the green fodder of the previous period. By comparing the analysis of the food with the analysis of the excrement during the last week of both diets, when the animals had become accustomed to the foods, the proportion digested was ascertained. The figures in the following table show the percentage digested of each constituent supplied : —

	Green Clover.	Clover Hay.
Albuminoids	72.5	69.7
Fat	75.1	72.8
Extractive matter	79.0	74.8
Woody fibre	58.2	52.0
Total dry matter	66.4	64.0

It will be seen that the results (and the same is true of the experiments with lucerne) are slightly in favor of the green fodder ; the differences, however, are not greater than are often observed in the same animal fed with the same food at different times. Moreover, the oxen had really a slightly better diet with the green food than with the dry, notwithstanding the care taken to make the experiments uniform, for the animals rejected some of the coarse stalks in the green food, but could not do this with the hay, which was supplied as chaff. Professor Kuhn therefore concludes that the feeding value of hay is sensibly the same as that of the green food it is made from, assuming, of course, that the hay is well made, and neither loses its more delicate parts by too much knocking about in the field, nor suffers injury from rain.

The result is very different when fodder of different ages is compared. Professor Wolff fed sheep with green clover during the four weeks in which the clover was in blossom. The proportion of the clover digested at the commencement and end of this period was as follows : —

	Clover commencing Blooming.	Clover ending Blooming.
Albuminoids	75	58
Fat	66	44
Extractive matter	78	70
Woody fibre	56	38
Total dry matter	69	56

The age of the plant thus makes a wonderful difference in its digestibility. It will be noticed that the fibre, fat, and albuminoids suffered most in digestibility with advancing age, and the soluble extractive matter suffered least.

We see from these results that the feeding value of albuminoids, or fat, or any other constituent of fodder, may be very different in different foods. Chemical analysis, in telling us how much fat or albumen a food contains, does not, therefore, determine its nutritive power ; we must at the same time take into consideration the nature of the food. As a general rule, the ingredients of seeds have a higher nutritive value than the ingredients of green fodder, and these again a higher value than the same ingredients contained in straw. Analysis should, therefore, mainly be used for comparing a food with others of the same class, as seeds with seeds, straw with straw ; it cannot safely determine without experiment that a sample of straw is more nutritive than a sample of hay.

This is well illustrated by some experiments made by Heidepriem, to which we can make but the briefest possible reference, as this article is already longer than we intended. He fed merino sheep on various diets of lupine straw, lupine hay, and lupine seed. The results showed a uniform rise in the digestibility of the food as its quality improved. Thus, not only did the hay supply much more albumen than the straw, but the albumen it contained was nearly twice as digestible as that in the straw, 37.5 per cent. being digested in the one case, and 74.3 in the other. The seeds were found to be superior in this respect to the hay, nearly the whole of the albumen they contained being assimilated by the sheep. The great feeding value of oil-cake is in like manner due, not only to its composition, but also to its easy digestibility.

DECREASE OF FARM LABORERS IN ENGLAND.

According to recently published statistics, the agricultural workers in England are steadily diminishing in number. The harvest is great, but the laborers are becoming fewer and fewer. In the census, persons "working the land" are grouped under the seven heads given in the table below, which shows the number in each class according to the last three of these decennial enumerations : —

	1851.	1861.	1871.
Farmer, grazier	249,431	249,735	249,907
Farm bailiff	10,561	15,698	16,476
Farmer's son, grandson, brother, nephew	111,704	92,323	76,466
Farmer's daughter, granddaughter, sister, niece	105,147	83,830	92,187
Agricultural laborer (outdoor)	952,997	958,265	798,087
Farm servant (indoor)	288,272	204,962	158,756
Shepherd (outdoor)	12,517	25,559	23,323

The "farmer, grazier" section has remained remarkably steady at each census, showing a very slight increase. Farm bailiffs increased about 50 per cent. in the first decade, and a small addition was made to their number in the second decade. The farmers' sons, etc., the farmers' daughters, etc., are placed in the class because they almost invariably work, we are told, on the farm or engage in some farm operation. The sons, etc., have exhibited a steady decline, while the daughters, etc., diminished largely between 1851 and 1861, but during the last decade have increased by upwards of 8000. The most noticeable change is that apparent in the two next sections. The outdoor agricultural laborers have decreased since 1861 by 160,000 ; the decrease of the indoor farm servants was great both in 1861 and 1871. There seem to be nearly 130,000 less in this section than 20 years ago. The shepherds, who doubled their numbers between 1851 and 1861, fell off between 1871 and 1861 by more than 2200. Counting all below the farm bailiffs as supplying ordinary farm labor of one kind or the other, it will be found that the working force in 1861 was 1,365,000, and that in 1871 it amounted to 1,149,000 hands ; hence the decrease in the latter year was nearly 16 per cent.

NOTES FROM ABROAD.

Farming in Belgium. — An English agricultural journal says : "English and Scotch farmers might take a lesson from the Belgian agriculturists in their prodigious care of manure — no wasteful exhalation, no neglect of the liquids which enrich the soil. We might almost say that the Belgian farmer is a reverential worshipper of manure. It is his idol, his treasury. In the first place, there is the manure produced in the cattle-sheds. No cow is allowed to go about in the open air ; all stay within doors, and liquids which we too often see running to waste, are carefully conducted into covered tanks. Neither is the solid part allowed to be in the open air ; it is covered from sun and rain, which destroy the ammoniacal salts, and trodden by three or four young cattle during the winter. In addition, the farmer collects from his ditches and streams aquatic plants, which he mixes with the manure, or uses them at once to hasten the growth of the potato. He sends to a distance for the mud dredged from canals, and lime ; in the nearest town he buys the refuse from tanneries and manufactories, animal black, cinders, street-sweepings, crushed bones, and the refuse of flax and colza. His younger children are out at dawn with a little cart, gathering up from the roads and fields all that, according to agricultural chemistry, can restore to the land what has been drawn from it. Peru sends its guano ; and the farmer is seen in spring, sack in hand, sowing the precious powder on the barren portions of his land ; and the flinty soil swallows it all with such promptitude that it must be manured twice or three times a year. In no country is such high farming carried on."

Earthen Jars for Packing Strawberries. — In France, where strawberry culture is very extensively pursued, and the transport of the fruit to the great markets is an important consideration, small jars of baked earth have superseded baskets for the package of fruit, of late. They hold about a quart of fruit each, and are conveyed in large baskets. The fruit is said to come to market in these jars in fine condition.

Gumming in Fruit-Trees. — M. Prillieux, in a paper on the cause and cure of gumming in fruit-trees which he recently read before the Académie des Sciences, at Paris, gives the following practical suggestions on the subject: "Among the remedial measures which have been proposed for the cure of this gum disease, there is one which, to my own knowledge, has been very effectual. This is the scarification of the bark. I have seen trees which were severely attacked by the disease, and unable to produce any but small and feeble shoots, completely restored to health and sending forth fresh, vigorous shoots, after longitudinal incisions had been made in the bark of the branches. The open wounds keep up a very active irritation in the bark, and the food-stores are diverted to the formation of new and heathy cellules, and cease to be drained away to the gum-centres, while the vital energies of the plant soon tend to resume their regular course. Scarification, in fine, acts as a powerful diverting agent against the disease."

Plants as Manures. — M. Boutin, in the *Journal de Pharmacie*, states that he finds certain of the *Amaranthaceæ* remarkably rich in nitre. Of many plants examined by him, *Amaranthus blitum*, *A. atropurpureus* and *A. melancholicus ruber* are particularly noteworthy. The last is a plant of exotic origin cultivated in gardens in France for ornamental purposes. M. Boutin's analysis shows that after drying at 100° C., the tissues contain 16 per cent. of nitre — corresponding to 2.2 per cent. of nitrogen and 7.4 per cent. of potassa. The dried tissues of *A. atropurpureus* give 22.77 per cent. of nitre, or 3.2 per cent. of nitrogen, and 10.7 per cent. of potassa. After drying the plants for some time

in the open air, the stem and branches become covered with a crystalline efflorescence of delicate needles of nitre, and on incineration burn away almost like gunpowder, so that these plants may be looked upon as true nitre-producing shrubs. In view of these facts, the author asks if it may not be that, in a future more or less remote, the *Amaranthaceæ* will be cultivated to supply nitrogenous manures, the sources of which are being rapidly drained, although the demand for them is constantly increasing?

Forest Clearing by Steam. — Some interesting experiments in the clearing of wooded lands took place lately in Scotland. The experiments were carried out under the auspices of the Canadian Land Reclamation Company, and were intended to demonstrate the ease with which the forests of Canada could be cleared by means of a new process, patented by Mr. Andrew Gilchrist. A traction-engine, of twelve horse-power, is stationed some distance off from the wood, and a wire chain is fastened to the tree. Steam is then put on, and the tree is pulled forcibly out by the roots. An objection to the adoption of the process was that it would injure the wood by splitting the tree, but the experiments showed that, with proper precautions, there was no fear of such a result. In the course of five hours upwards of 300 trees in a plantation nearly 100 years old were pulled out. Of that number, not above half a dozen were broken, and in these cases the result was wholly due to the inexperience of the ploughmen engaged in the work, who placed the chain too high up the tree. Those present expressed themselves highly gratified with the process; and as the trees in Canadian forests would be more easily uprooted than those experimented upon, it is anticipated that the company will be able to clear vast tracts in a very short time.

Packing Fruits for Travelling. — Mr. Carson, President of the Horticultural Society of Victoria, succeeded in sending to the Exhibition at Vienna fresh apples, pears, etc., grown in Victoria. They were carefully gathered, and each fruit was wrapped up in clean, unused tissue paper. A layer of dry cotton-wool was then laid in an ordinary case, and on this a layer of apples in paper. More cotton was rammed in between the apples and the sides of the case, as well as between the fruits; another layer of cotton succeeded, followed by fruit as before, and so on until the case was filled. The lid was then nailed on in the usual manner, and the packing was complete. The cases were placed in the ice-room of the steamers until landed. The fruit when unpacked was in fine condition.

Rooting Cuttings in Coke Dust. — Mr. E. Hobday, in *The Garden*, says: "I have often proved that cuttings of soft-wooded plants that are very liable to damp off may be struck with greater certainty in charcoal or coke dust than in the usual way in sand. It imparts a greater porosity to the soil, damp cannot lie about the base of the cuttings, and there is less danger if an inexperienced hand does the watering. Amongst other things we have this year struck our spring stock of Tricolor Geraniums in coke dust, and we have certainly never had more success. It is not a bad substitute for sand, for covering in spring very small seeds of tender annuals that are usually sown in pots, pans, or boxes, especially if there are any snails or slugs in the immediate neighborhood, as they will not travel over it. I should explain that what I mean by coke dust is simply the dust taken from the coke heap, and which is afterwards passed through a very fine sieve."

Thoroughly French. — The lady visitors to the Jardin d'Acclimatation at Paris do much injury to the flower-beds by gathering and carrying off the fairest specimens; and this has led to the posting of the following graceful appeal: "Les fleurs qui ont des crinolines sont priées de faire grâce à celles qui n'en ont pas."

Boston Journal of Chemistry.

Jas. B. Nichols, M. D., *Editor.*
Wm. J. Rolfe, A. M., *Associate Editor.*

BOSTON, SEPTEMBER 1, 1874.

THE CENTENNIAL OF CHEMISTRY.

Pursuant to the call issued by the Committee of Chemists, and published in the August number of the Journal, about seventy chemists, representing all branches of the science, met at the little town of Northumberland, Pa., on the 30th of July, to celebrate the hundredth anniversary of the discovery of oxygen, and to do honor to the memory of Joseph Priestley. Simultaneously with the meeting at Northumberland the chemists of England met at Birmingham, to celebrate the same event and to unveil a statue of Priestley. Thus two nations united to do honor to the man who had been persecuted and driven from his home by the one, and who received but a cold welcome from the other.

The meeting was organized by the appointment of Prof. C. F. Chandler as president. He was conducted to the chair by Dr. Joseph Priestley, of Northumberland, a great-grandson of the distinguished savant. After a short address of welcome by David Taggart of Northumberland, and a brief response from Professor Chandler, Professor Crofts, of Toronto, Canada, gave an address upon the life and labors of Dr. Priestley.

Priestley, like all great thinkers, early met with opposition. He was refused orders in the church because of his heretical notions, and then passed through many other churches in succession, only to quarrel in turn with each, until he finally adopted the Unitarian form of belief. This, in a community made up of Trinitarians, was at that day much worse than no belief at all, and as the doctor was moreover a vigorous controversialist and did not hesitate to speak his mind upon all subjects, he led but an uneasy life. He had the appointment of botanist and astronomer on Captain Cook's Expedition, but some one soon discovered that it would never do to allow a heretic a high position in his Majesty's service, so he received permission to stay at home. These persecutions finally culminated in the destruction of his house by a mob, because he was suspected of sympathizing with the French Revolution. He sought refuge at first in London, but all doors were closed against him there, and he finally came to America, whither his son had preceded him. Here of course he was again on the wrong side in both politics and religion, but persecution did not go any further than severe attacks upon him through the papers. During all the time he was engaged in these bitter controversies he was also, with the limited means at his command, making brilliant discoveries in physics and chemistry. He discovered more than three fourths of the permanent gases. It seems a marvel that one man could have accomplished so much as he did. His published works comprise over sixty volumes.

After the conclusion of the address, Professor Horsford read a number of letters written by Priestley to Judge Thatcher of Maine, about the year 1800. In these, politics, religion, and science are strangely mixed. He was still vigorously defending the phlogistic theory of Stahl, and did not hesitate to characterize Lavoisier and the rest of the French chemists in very energetic language.

During this session of the congress the following dispatches were sent and received: —

Northumberland, *July* 31, 1874.

To the Priestley Memorial Committee, Birmingham, England:

The brother chemists at the grave to their brothers at the home of Priestley send greeting on the centennial anniversary of the birth of chemistry.

Birmingham, *July* 31, 1874.

To the American Chemists assembled at Northumberland, Pa.:

Our statue of Dr. Priestley will be unveiled tomorrow at Birmingham; presented by the subscribers through Professor Huxley to the town, and accepted by the mayor. We greet you as colleagues engaged in honoring the memory of a great and good man.

To this a reply was returned as follows: —

Northumberland, Pa., *July* 31, 1874.

To the Priestley Memorial Committee, Birmingham, England:

Welcome dispatch received. Professors J. Lawrence Smith, Youmans, and Joy appointed committee to represent us in spirit at unveiling of Priestley's statue.

The noon recess was pleasantly spent in inspecting the residence of Dr. Priestley and the remains of his apparatus. In the afternoon Prof. T. Sterry Hunt gave an address upon the subject of Chemical Theory in the last Hundred Years, showing how the views endorsed by Dr. Priestley had been laid aside mainly as a necessary consequence of his own discoveries, and how the nomenclature of Lavoisier had come into use until now it was universal.

In the evening, just before sundown, the assemblage met around the grave of Dr. Priestley, to listen to an address by Dr. Coppée of Bethlehem, Pa. The hour, the associations, and the oratory combined to make this one of the most eloquent addresses we have ever listened to. The concluding sentences were as follows:

Could he rise from that sod and hear the wonders of science and the marvels of art of to-day, what would be his astonishment at the photograph of his own picture; at the crowds that have come by railway expresses to do him honor; at the announcement that under the ocean waves the medium which he loved to handle was sending from the Priestley centennial gathering in Northumberland, in an instant flash, greeting to the crowds who, three thousand miles away, were making the welkin ring with plaudits as his statue is unveiled at Birmingham — that Birmingham which, only three quarters of a century ago, sacked his laboratory, burned his house, and drove him and his children away and out of England with a ferocious bigotry which was not essentially English, but inherent in human nature in all ages, and especially characteristic of that age in Europe. . . .

This is an unusual celebration, and this particularly is the strangest scene of this singular drama. This peaceful field and Acre of God, in this most charming evening hour, happily suggested by a lady chemist; these surrounding hills; this gleaming river, which lends breadth and beauty to the landscape, this distinguished assemblage standing reverently but not mournfully around the grave — these do not tell us of death, but of life; not of decay, but of resurrection; not of oblivion, but of immortality. They tell us that in the inexorable past there is but a semblance of imprisonment; that

the good and the true break the flimsy bands and come back to gladden the hearts of men. Such are the pleasant thoughts, fancies, and yet living facts which cluster around the grave of Joseph Priestley.

At the conclusion of this address we assembled once more in the hall to listen to an essay by Prof. J. L. Smith on the Progress of Industrial Chemistry since 1774, in which he traced the development of many of the great industries of the day from their small beginnings, showing that almost all of them were dependent on chemistry, and how little advance had been made beyond empiricism until Priestley's discovery of oxygen paved the way for future progress.

On the morning of the 1st of August we met again for the purpose of listening to an address by Prof. B. Silliman upon the History of Chemistry in America. This was a long and exhaustive essay, and was read only in part. It will be published in full, as will most of the other papers, in *The American Chemist.*

At noon the meeting adjourned, to reassemble in 1974. The gathering as a whole was one of the most pleasant we have ever attended. Old acquaintances were renewed and many new ones made, and we earnestly hope that we shall not have to wait a hundred years before we have another reunion. In fact, arrangements have been made to invite the chemists of the world to meet at Philadelphia in 1876. S.

STREET-LIGHTING IN PARIS.

M. Maxime du Camp, in the *Revue des Deux Mondes*, gives an interesting history of the street-lighting of Paris. In olden times all good citizens were commanded in periods of trouble to put a light in their windows and a pail of water on the threshold of their doors. These precautions were intended to prevent fires and nocturnal attacks. The first attempt at street-lighting was made in 1558, when, by an ordinance of the Parliament of Paris, a *falot* was placed at the corner of every street, and in the case of very long streets, an additional one in the middle. This instrument resembled a gibbet, having suspended from it by a chain a heavy iron bowl filled with resin and tow. The *falots* did not illuminate the city very brilliantly, though they served a tolerable purpose for that day; but the Wars of the League soon put an end to them, and for the next century Paris was left in utter darkness. Louis the Fourteenth, who, by the way, took for his device a rising sun, ordered Nicolas de Reynie, the founder of the city police, to put an end to this state of things, and gave him by way of instructions three words — cleanliness, light, safety. Very little time was lost, and in 1667 the edict was published prescribing the establishment of lanterns. These were simply candles, enclosed in a glass frame, and suspended by cords at the height of the first story of the houses. Lanterns were, in 1745, succeeded by oil-lamps, which remained in use till within the memory of many living persons.

Philippe Le Bon, the inventor of gas, met with a tragical fate. On the day of the coronation of the first Napoleon, the unfortunate inventor was assassinated, being mistaken, it is said, for the emperor. Three years before this, in 1801, he had exhibited his wonderful discovery in public; but although he had shown the quality of light that he could produce either from coal or wood, the chief point which struck the minister of the First Consul was, that the distillation of wood produced cheap tar. To Philippe Le Bon was therefore granted the concession of part of the forest of Rouvray for the purpose of making tar.

The widow of Le Bon endeavored to carry out the plans of her deceased husband, but on her death the patent was suffered to lapse by her family, and was taken up by a German naturalized in England, named Winsor. Curiously enough, the French were slow to appreciate the advantages of gas. It was not till the year 1830 that the first street in Paris, the Rue de la Paix, was lighted by gas in the face of a violent opposition. Every misfortune was attributed to the unpopular light. Whatever the calamity might be, — the death of a tree or the arrival of the cholera, — it was all charged to the gas.

For some time the lighting of Paris was in the hands of several companies, but by degrees these have been fused into one great corporation, owning ten great factories in and around the city. The Parisians, who found it so difficult to accustom themselves to the new light, are now great and increasing consumers of gas. In 1855 they consumed 53,000,000, in 1865 they used 155,000,000, and in 1872 no less than 196,000,000 cubic yards of gas. This vast monopoly is charged heavily by the municipality in various ingenious ways. To begin with, the company pays the city 200,000 francs ($40,000) per annum, for the rent of the ground occupied by its pipes, and, in addition, assumes all costs of paving, etc. In 1869 these expenses reached 179,667 francs, and were estimated at 100,000 francs in the municipal budget for 1873. It is true that the company pays no *octroi* duty on coal, but, on the other hand, pays a fixed duty of two centimes on every cubic metre (about 37 cubic feet) of gas made. On this account alone the company paid 2,508,953 francs in 1872, and was also obliged to pay to the city a proportion of its profits, amounting to 5,000,000 francs. The municipality thus received from the gas company in 1872 no less than 7,708,953 francs, or about $1,500,000. This is truly a tremendous tax upon light; and yet the price of gas in Paris is much lower than in Boston.

ACTION OF CAMPHOR ON PLANT LIFE.

In the latter part of the last century some experiments were made by a Mr. Barton, in England, upon the stimulating action of camphor on plants. A tulip, placed in a solution of camphor, showed vigorous growth, and was longer in withering than other tulip slips, of the same kind, placed in ordinary water; and a withering yellow iris through treatment with camphor seemed, for some hours, endowed with new life. Barton came to the conclusion that camphor is a more powerful stimulant for plants than any other known substance; and he compared its action to that of spirituous liquors, or of opium, on the human body, when taken in certain quantity. These almost forgotten experiments have been recently repeated, in new forms, by M. Vogel of Munich, with very similar results.

M. Vogel obtained a homogeneous solution by rubbing camphor with water, and shaking camphor powder in a flask with distilled water. Two similar branches of a flowering syringa were then introduced, one into ordinary water, the other into the camphor-water. In twelve hours the former drooped and was near withering; the other branch stood upright, and without any sign of withering, — some of its buds were even developed, and it was not till three days after that it began to wither. Another flowering branch of syringa, which was nearly dead, was placed in the camphor-water, and a marked renewal and recovery was soon observed, which lasted some time. Frequent repetition of the experiment with branches of syringa showed the same result in varying degree.

The action of camphor on cut branches of living and fully developed plants naturally suggested the idea that the substance must also have an influence on the germination of seeds, and experiments proved this to be the case. Seeds of various plants were tested, and old ones were mostly selected, as their germinative force appears to be weaker than in fresh seeds. The seeds were spread out on some moistened blotting-paper covering a porcelain plate, and a second moist paper was put over them.

For the first experiments, seeds of *Lepidium sativum* of the years 1869 and 1871 were taken. The entire duration of the germinative force of Lepidium sativum is known to be three years. The seeds of both the years mentioned, treated with ordinary water, showed a very imperfect, retarded germination, while the seeds moistened with camphor-water germinated very soon — those of the year 1869 in twenty-four hours, those of 1871 in seven hours. Similar results were obtained with other seeds, some of which were five or six years older than will ordinarily germinate. Treated with camphor-water, they not only germinated, but were several days earlier than fresh seeds under the most favorable conditions. In some cases not a single seed out of a large number sown in garden ground sprouted at all, while others of the same age started very promptly under the stimulus of the camphor.

The after development of some of the seeds that were treated with camphor was observed by Dr. Raob, the seeds having been put into the ground. It is interesting to know that the traces of the camphor treatment were here also visible, the young plants showing greater vigor and freshness.

These facts show that in camphor we have a stimulant for plants, capable of both strengthening the force and accelerating the rapidity of their vegetation. It is not probable that it will be of much practical value for that purpose, at least on a large scale, but the amateur will no doubt sometimes find it useful in starting his flower seeds, and we can imagine cases in which the professional floriculturist may employ it to advantage.

A NEW WATER-PRESSURE INDICATOR.

Calling in at the office of Mr. J. Whitney, City Treasurer of Cambridge, a few days ago, our attention was attracted to a novel instrument attached to the wall. On inquiry we learned that it was a self-registering water-pressure indicator. The essential portions of it are two cylinders connected by an inverted siphon. The lower of these, which is of about half the diameter of the other, is connected at its upper end with the water service of the city. The upper cylinder contains a float of iron, to which is attached a pencil resting against

the surface of a vertical cylinder similar to those used on the ordinary chronograph, and actuated by clock-work in the same manner.

The pencil, by tracing a line upon the paper attached to the cylinder, shows what was the pressure of the water at any part of the day. It is interesting to examine the charts made by this instrument, as they show very clearly the fluctuations to which the water is subjected. During the daytime the service is supplied from a stand-pipe; and the area of this being small, the fluctuations are very rapid. At six o'clock the stand-pipe is disconnected and the reservoir is used during the night, and the sudden decrease of pressure is shown by a vertical line upon the chart. But from six to eight P. M. a great deal of water is drawn from the pipes for watering gardens, and this is distinctly shown by the chart. The pressure from eight o'clock gradually rises, and attains its maximum about midnight, when comparatively little water is used. Now, however, it commences to sink very slowly until four A. M. This is supposed to be due mostly to leakages in the pipes. At four A. M. it begins to sink much more rapidly, as people are then commencing to use it again. From this time the fall is very rapid until six A. M.; when the stand-pipe is again attached. The object of having the upper cylinder larger than the lower is to shorten the chart on which the record is made. If they were of equal size the record would be too long and the instrument too sensitive. S.

EDITORIAL NOTES.

Chemistry in Verse. — In referring, some months ago, to Mr. J. Carrington Sellars's versified "Chemistry," we mentioned that he intended to issue a cheaper edition of the book for general circulation. This is now ready, and the price is only 8d. a copy, or 20 cents, postpaid, to American purchasers. The address of the author and publisher is Ferry Buildings, Birkenhead, Eng. The work has been carefully revised, and some of the peculiarities of phraseology (including the title "Chemistianity") have been deleted or modified. The statement of chemical facts is concise, clear, and accurate, and embodies the results of the latest research. In this respect the book is in advance of many elementary treatises intended for popular reading or school use. A brief extract from the chapter on Hydrogen, printed as plain prose (which, notwithstanding the author's arguments in favor of making "verse" of it, we think the better way), will give an idea of the style: —

"Hydrogen, the chief stellar element, the lightest body known in creation, is a colorless and tasteless metalloid, an odorless gas (or aeriform body). No pressure known as yet will liquefy this gas; it is easily kindled, evolving great heat but little light, and with pale yellow flame. Hydrogen burnt in air combines with oxygen, producing water as the resulting product. The flame from hydrogen will produce sound by burning its jet within a long glass tube; the vibrations produced yield a musical tone. Hydrogen passed over copper oxide, heated to redness, produces water, and transforms the oxide to metallic copper. Hydrogen, when mixed with half its volume of oxygen, will burn in jets with intense heat; the same mixture ignited within a vessel will explode and unite with great violence. When burning hydrogen, mixed with oxygen, the flame is solid — not hollow like common flame. A trace of hydrogen will dissolve in water. This metalloid is not a poisonous gas, yet will not support what we distinguish as life. Hydrogen has high diffusive power, and should not be kept for a long period in bags or holders, for fear of leakage and the formation of an explosive mixture. Hydrogen will penetrate platinum, and iron tubes, whilst exposed to a red heat; it is then absorbed and said to be 'occluded.' Finely divided, or rolled plate platinum, will condense and unite the mixed gases (two of hydrogen and one of oxygen), in the cold state and without violence, producing water in the form of dew; palladium, gold, stones, and even glass, though they sometimes require the aid of heat, possess the same power to a less degree."

To Illustrate the Maximum Density of Water. — If a pear-shaped vessel or small glass balloon be filled with a colored liquid and so adjusted that it will float just below the surface of distilled water at 39° F. (its greatest density), it can be employed to prove that water of a higher or lower temperature is lighter than at this temperature. The little toy is placed in a tall glass cylinder filled with ice-water, when it sinks to the bottom; warm water is then slowly added until the balloon rises to the surface, when a thermometer may be inserted to show the temperature. On adding more warm water the ball sinks again to the bottom. The adjustment must, of course, be very carefully attended to, which may be accomplished by wrapping the vessel with platinum wire.

The Cost of the South Kensington Museum. — According to a recent parliamentary return the total cost of the South Kensington Museum, from its commencement to the end of the financial year 1873–74, has been £1,191,709 19s. 4d., or, in round numbers, $6,000,000. The cost of purchases for the museum has been about $1,500,000, of which $150,000 has been expended for reproductions, plaster casts, etc.; $200,000 for the art library; $100,000 for the educational and scientific collections; and the remainder for sculpture, wood and metal work, jewelry and goldsmith's work, earthenware and stoneware, etc.

A Merited Tribute to a Scientific Man. — The French government not long ago presented to the National Assembly a proposal which accords to M. Pasteur an annual pension of 12,000 francs as a national acknowledgment of his valuable labors on the preservation of wine, on the manufacture of beer and vinegar, and on the silk industry. All friends of science will applaud the Minister of Public Instruction for suggesting this testimonial to an eminent *savant*.

FACETIÆ.

Two Centuries Hence. — The following fancy picture of what may be familiar enough two hundred years hence is no more improbable on the face of it than our railways, electric telegraphs, and the like, would have seemed a century ago: —

"Scene — Library in the house of an elderly gent, somewhere in Australia. Old gent telegraphs to the kitchen, and waiter ascends in a balloon. *Old Gent:* John, fly over to Calcutta, and tell Mr. Johnson that I shall be happy to have him sup with me. Never mind your coat now, but go. John leaves, and at the end of five minutes returns. *John:* Mr. Johnson says he will come; he has got to go to St. Petersburg for a moment and then he will be here. *Old Gent:* Very well, John. Now start the machine for setting the table, and telegraph to my wife's room, and tell her that Mr. Johnson is coming; then brush up my balloon, for I have an engagement in London at twelve o'clock. John flies, and the old gentleman runs over to the West Indies to buy a fresh orange."

A Pair of Pretty Compliments. — Sir George Rose being introduced one day to two charming young ladies, whose names were Mary and Louisa, he instantly added, with a bow, "Ah, yes! Marie-Louise — the sweetest pear I know;" a compliment almost worthy of being coupled with that most graceful one of Sydney Smith, suggested by the sweet-pea. A young lady, walking with him in the garden, paused to examine a favorite flower on which she had taken great pains. "I am afraid, Mr. Smith," she said, "that this pea will never come to perfection." "Then allow me," taking her politely by the hand, "to lead perfection to the pea!"

ATOMS.

In the recent exhibition at the Royal Academy, London, a number of etchings and oil-paintings, some of them said to be of great merit, the work of English surgeons and physicians, were on exhibition. — Dr. Hooker, of Kew Gardens, than whom there is no higher authority upon such matters, has officially informed the English colonial office that the sanitary virtues of the Eucalyptus globulus have been greatly exaggerated. — *Harper's Magazine* for September, with other illustrated articles, contains a second paper on "Observatories in the United States," including a full account of those at Cambridge, Hanover, and Albany. — The *Westminster Review* begins a notice of "The New Chemistry" with the remark that "Prof. J. P. Cooke, of Harvard University, has enriched the 'International Scientific Series' by what is in our opinion by far the most valuable and original work which has yet appeared in that Series." — It has been ascertained experimentally that negative electricity attracts flame, while positive repels it. — A recent English invention is the coating of white glass lenses with a film of colored glass, instead of making them of the latter material throughout.

LITERARY NOTES.

The Appletons have now ready the *fifth* and concluding volume of Prof. Austin Flint's *Physiology of Man*. The first volume was published about ten years ago, and the work has steadily gained in reputation with each instalment issued. It is by far the most complete and comprehensive treatise of the kind that has appeared in this country, if indeed it be not the best in the English language. The present volume is devoted to the Special Senses and Generation, and has all the good points of its predecessors, which are too well and widely known to call for any extended notice, even if our limits allowed it.

The Harpers publish in a handsome and fully illustrated octavo *Captain Tyson's Arctic Experiences*, containing the story of the Polaris expedition, the cruise of the Tigress, the remarkable drift on the ice-floe, and the rescue of the survivors. The work has been long expected, but no one who reads it will regret that ample time has been taken for its preparation. The result fully justifies the delay, the task having been performed with a care and thoroughness that leave nothing to be desired. Biographical sketches of the leading men of the expedition, a summary of its scientific results, and a carefully prepared chronology of Arctic explorations add greatly to the interest and value of the work.

The Nimrod of the Sea, by W. M. Davis, published by the same house, is a vivid picture of life aboard an American whaler. It is not a fictitious sketch, but the record of an actual experience, full of strange and thrilling adventure, and abounding in forecastle yarns. The author's spirited description of the chase and capture of whales, of the accompanying excitements and dangers, and of the processes of melting up and trying out the blubber, with his accounts of the hardships, sufferings, and wrongs which whalemen undergo, make up a volume which readers young and old will welcome as a most entertaining addition to the literature of seafaring life.

Dr. Ox, and Other Stories, is another of Jules Verne's popular books lately published by J. R. Osgood & Co., and already in its third edition. The opening story of Dr. Ox's experiment of adding an extra amount of oxygen to the air in a slow Dutch town, and the singular effects produced on the phlegmatic citizens, is in the best vein of this entertaining writer.

The same house issue a new edition of Clarence King's *Mountaineering in the Sierra Nevada*, with an additional chapter, maps, etc., which add to its value, while the price of the book is reduced; also *Workingmen's Homes*, edited by Rev. E. E. Hale, which is of a really practical character, and should be read not only by men of moderate means who want homes of their own, but also by capitalists who wish to build houses adapted to the wants of that class of tenants.

The Address before the Association of Graduates of the U. S. Military Academy, at their annual reunion, June 11, 1874, by Prof. Charles Davies, has been printed in a neat pamphlet by A. S. Barnes & Co. It contains an interesting historical account of the West Point School. *Peck's Practical Arithmetic*, from the same house, is a good school text-book and true to its title. Teachers will do well to examine it.

The third and fourth numbers of Estes and Lauriat's *Half-Hours with Insects* have been issued, and are worthy of the same commendation we have already given to the series.

Medicine and Pharmacy.

THE DIAGNOSIS OF BLOOD-STAINS.

The difficulty of determining whether a dried blood-stain is the blood of man or that of some other animal is well known; indeed, some of the best authorities have declared that it is impossible to do it with certainty. Professor A. S. Taylor, in the latest edition of his "Medical Jurisprudence," gives figures of red blood corpuscles of ten different animals, as they appear under the microscope, with the statement that "there are no certain methods of distinguishing, microscopically or chemically, the blood of a human being from that of an animal, when it has been once dried on an article of clothing." Caspar and others allege that the difference between the red blood corpuscles of man and those of domestic animals is too minute to render their positive discrimination possible, and too insignificant to admit of its being used as the means of condemning a fellow-creature to death. It has been urged also that the variations in the mean diameter of the corpuscles are so frequent and irregular as to render any such averages of their measurement unreliable. The contraction of the corpuscles in drying likewise complicates the problem, and many investigators believe, with Virchow and Brücke, that no microscopist can "hold himself justified in putting in question a man's life on the uncertain calculation of a blood corpuscle's ratio of contraction by drying."

But Dr. J. G. Richardson, of Philadelphia, who we need not say is one of the most accomplished microscopists in the country, maintains, and in our opinion demonstrates, that with the aid of *high powers of the microscope* we may positively distinguish stains caused by human blood from those of the blood of the pig, ox, sheep, horse, goat, cat, and other animals, and this even when the stains are five years old. He sends us an interesting paper on this subject, which he read before the American Academy. It is much too long to be reprinted, but we will make an abstract of its leading points.

In his observations, Dr. Richardson used a $\frac{1}{50}$ objective, giving with the micrometer eyepiece an amplification of 3700 diameters. When thus magnified the human red blood disks appear about one inch and one eighth in diameter, so that even slight differences in their size can be accurately measured. Among one hundred red corpuscles freshly drawn from five different persons, the maximum, minimum, and mean diameters were as follows: —

	Max.	Min.	Mean.
Twenty from a white male aged 30	1-3231	1-3500	1-3355
" " " " " " 38	1-3281	1-3529	1-3375
" " " " female " 44	1-3249	1-3500	1-3381
" " an African " " 50	1-3182	1-3559	1-3384
" " a white male " 8	1-3231	1-3500	1-3398
Average of means			1-3378

The measurement of twenty corpuscles from part of the first of these specimens dried in a thin film upon a slide gave a maximum of $\frac{1}{2800}$, a minimum of $\frac{1}{3621}$, and a mean diameter of $\frac{1}{3182}$ of an inch.

It will be seen that the variations in diameter are not very great; and, as is further shown by Dr. Richardson, the smallest red disks of human blood, as usually met with, are larger than the largest corpuscles of an ox or sheep. It should be borne in mind that ordinarily in criminal cases the microscopist is called upon to determine, not whether a particular specimen is human, as distinguished from all other kinds of blood, but to discriminate simply between the blood corpuscles of a man and an ox, a man and a horse, or a man and a sheep, and so establish or disprove the defendant's story as to how his clothing or other articles became stained with blood.

All the arguments of opposing authorities are fully answered by Dr. Richardson, but, as he remarks, "all these theoretical considerations are of secondary importance in comparison with the positive fact as to whether practically we can or cannot discriminate the stains of human blood from those made by the blood of oxen or sheep." He has, therefore, endeavored "to *work out* a conclusive answer to this question" in the following manner: —

"On the 16th of May, 1874, my friends, Prof. J. J. Reese and Dr. S. Weir Mitchell, each kindly prepared for me three packages of dried blood from stains made by sprinkling the fresh fluid from an ox, a man, and a sheep, upon white paper. The two series were simply numbered 1, 2, and 3, and a memorandum preserved by each gentleman, specifying which kind of blood composed each sample. By this plan it is obvious that I was prevented from having any clue to the origin of the specimens save that afforded by the microscope, and my examinations and measurements were, therefore, entirely free from bias."

The measurements he obtained of ten red disks from each sample, selecting simply those which had become least distorted, are thus tabulated:

Specimen No. 1.	Specimen No. 2.	Specimen No. 3.
1-3448	1-4762	1-5555
1-3572 (minimum)	1-4762	1-6060
1-3572	1-4878 (minimum)	1-5405 (maximum)
1-3572	1-4651	1-5880
1-3333	1-4878	1-6666 (minimum)
1-3125 (maximum)	1-4444 (maximum)	1-6060
1-3448	1-4444	1-5777
1-3278	1-4762	1-5555
1-3333	1-4651	1-5888
1-3448	1-4762	1-5777
1-3407 (mean)	1-4694 (mean)	1-5828 (mean)

We quote the inferences drawn from these results, and also the account of the second trial:

"Since the red corpuscles of human, ox, and sheep's blood measure, according to Gulliver, $\frac{1}{3200}$, $\frac{1}{4267}$, and $\frac{1}{3300}$ of an inch respectively, and previous experiments of my own had demonstrated a disposition to *slight* contraction in the corpuscles of blood-stains which have been dried and moistened again, I of course concluded that sample No. 1 was human blood, No. 2 was ox blood, and No. 3 was sheep's blood. On reporting these diagnoses to Professor Reese, I had the satisfaction of learning that they were 'entirely correct.'

"Careful examination of the three specimens furnished me by Dr. Mitchell . . . led me to analogous conclusions, as will be seen from the following table of measurements: —

Specimen No. 1.	Specimen No. 2.	Specimen No. 3.
1-4545	1-6250	1-3572
1-4762	1-6250	1-3390
1-4878 (minimum)	1-6060	1-3175 (maximum)
1-4347 (maximum)	1-6458 (minimum)	1-3278
1-4444	1-5880	1-3448
1-4762	1-5777	1-3333
1-4651	1-5555	1-3572
1-4878	1-5405 (maximum)	1-3390
1-4545	1-6250	1-3572 (minimum)
1-4878	1-5880	1-3636
1-4662 (mean)	1-5952 (mean)	1-3430 (mean)

"From these results, I of course decided that No. 1 was ox blood, No. 2 was sheep's blood, and No. 3 was human blood, and on reporting my conclusions to Dr. Mitchell, I was again very much gratified to receive a reply informing me that they were perfectly correct."

In order to show that accurate results may be obtained even when the stains are very old, a fragment from a blood-stain used for some experiments in May, 1869, was subjected to examination on the 23d of May, 1874, and the following is the record of the measurements of ten disks, with Dr. Richardson's comments: —

1-3572	of an inch.	
1-3448	" "	
1-3278	" "	
1-3125	" "	maximum.
1-3390	" "	
1-3509	" "	
1-3448	" "	
1-3509	" "	
1-3572	" "	minimum.
1-3448	" "	
1-3425	" "	mean of ten corpuscles.

"The corresponding average of my measurements five years ago was $\frac{1}{3474}$ of an inch, so that no further contraction seems to result from age, and as the outlines of the corpuscles appear quite as distinct now as they did soon after the blood was drawn, it seems probable that this microscopic evidence of human bloodshed will be equally unmistakable twenty or even fifty years hence, provided due care continues to be exercised in its preservation from moisture and external violence."

For a minute account of the manipulation of the specimens in these investigations, we must refer our readers to the original paper, which appears in full in the last number of the *American Journal of the Medical Sciences*. No recent contribution either to microscopic or to medico-legal science rivals it in interest and practical value.

DISEASE IN OUR BOOTS AND SHOES.

Sir James Paget recently gave a clinical lecture at St. Bartholomew's Hospital on "Maladies produced by Boots and Shoes," which is fully reported in *The Doctor*. The subject possesses so much interest that we give an outline of the main points for the benefit of our readers, both professional and non-professional.

Maladies depending on the wearing of too small and badly-fitting boots are many and varied, such as deformities of the toes, bunions, corns, in-growing nails, painful bursæ, etc. In order to study deformities of the toes, we should first obtain a good idea of a perfect foot. In a perfect female foot we find: 1. Great width and fulness of instep; 2. Well-marked great toe; 3. Long second toe, projecting a little beyond great toe; 4. Very small, or in some cases almost suppressed little toe.

In the old classic statues the second toe always projects beyond the first, but that natural type of foot is now rarely seen. The modern great toe generally extends beyond the second, invariably so in people with flat feet.

In the male the great toe is not quite so prominent as the second. The feet of all persons cannot be deformed, nor can corns and bunions be produced in every one. It is doubtless owing to their complete reactive nutrition, the repair that takes place in the night being more than enough for the day's waste. This is not impossible when we remember the complete repair that occurs after great muscular waste, as in athletes. The diseases caused by the pressure and friction of boots are thus classified: —

I. *Mutual Compression of the Toes.* Natu-

rally there is a considerable interval between the first and second toes, and in a less degree between the others, so that when the foot bears the weight of the body, each toe is free from contact with its fellow; hence, in wet clay you would receive a separate impression of each. In the deformity, though, which is produced by small boots, the toes are squeezed together, so as to form a transverse arch, the first and second toes then only bearing the weight of the body. Thus, there are formed: —

1. Soft corns between the toes by their friction on each other.

2. Hard corns on outer side of little toe and inner side of great toe, and projecting points pressed upon.

3. Complete immobility of the toes, except the great one. The natural mobility in civilized nations does not exist now in more than about one person in five hundred.

4. Painful bursæ between metatarsal bones.

5. In extreme cases corns and chafed spots are produced by the squeezing and rubbing together of the pads of the great and little toes.

Kid gloves, though worn continually, never cause bunions, since the kid stretches to the hands; but in the manufacture of boots, especially ladies' boots, unyielding canvas is used to line them, so that the leather is prevented from stretching and showing the true shape and size of the foot. The foot enlarges when bearing the weight of the body, and also towards evening; hence a boot thus made from a measure taken when the foot is suspended in the air, and in the morning, is too small for the foot in the evening. Women's feet are generally measured in the air, but men's when they are standing on them. The high heels in ladies' boots, too, cause them to be always walking down-hill, however level the path may be, thus driving the foot more and more to the front.

II. *Deflection of the Toes* falls chiefly on the *great toe*, the result of wearing —

1. Boots too narrow in front.

2. Boots (now out of fashion) having the point in a line with the centre of the heel; the great toe, which naturally is in a line with the inner side of the heel, being deflected outwards towards the point.

3. Short boots especially. In them the great toe is brought sharply in contact with the end, and as the tarsus and metatarsus will not yield much, and the metatarso-phalangeal joint will, a deflexion of the great toe takes place outwards, and sometimes downwards. This is the most frequent and worst form. This deflection of the great toe is the source of great trouble, as bunions occur over the metatarso-phalangeal joint, soft corns on the second, third, and fourth toes, under which it lies, and, worst of all, a total loss of movement in the great toe.

Treatment of the above Deformities. If just beginning, keep the toes apart by pads of plaster. Isinglass plaster upon felt is the best. The pad must be worn day and night. Of course, bad boots must be left off. The treatment by night is even more important than that during the day, for then especially repair goes on, and the least relaxation in the night more than undoes the good done in the day. Sometimes it has been considered necessary to divide tendons, but these do not produce the deformity; they merely adapt themselves to it. If they are divided, the deep-seated fibrous textures should be divided as well. In the worst cases the great toe has to be amputated.

There are also certain deformities of the second toe, but it is doubtful whether these deformities are due to the wearing of bad boots, as sometimes they are hereditary. The third and fourth toes have no special deformities; they suffer only by being lifted up or pushed down. The little toe sometimes almost disappears, from atrophy caused by pressure.

THE COMPARATIVE VALUE OF MEAT AND VEGETABLES AS FOOD.

Probably we Yankees eat more meat than any other people in the world. We carry to an extreme the belief in the importance of animal food which characterizes the Anglo-Saxon race. Whether we are really the better for it may well be matter of question. It is indisputable that perfect development of man, both physical and mental, may be attained on a vegetable diet, or one into which meat enters in very small proportion. In Dr. Pavy's "Food and Dietetics," noticed in our last number, we find the following sensible remarks on this subject: —

Thus it is seen that a great diversity exists as regards the food consumed by the human race in different parts of the globe. Instances are to be found where life is sustained upon a wholly vegetable, a wholly animal, and a mixed diet. The mixed diet, however, may be regarded as that which, in the plan of Nature, is designed for man's subsistence. It is upon this that he appears to attain the highest state of physical development and intellectual vigor. It is this which, certainly in temperate climes, he is led to consume by general inclination, when circumstances allow the inclination to guide him; and, lastly, it is this which stands in conformity with the construction of his teeth and the anatomy of his digestive apparatus in general. Notwithstanding these considerations, there are those — but few in number, it is true — who contend that vegetable food alone is best adapted to meet our requirements. Under the style of vegetarians, they act upon the principle they profess. It is true that vegetable food, with its large proportion of non-nitrogenous matter, yields, in a simple and direct manner, according to the views now entertained and fully discussed in an earlier part of this work, the requisites for force as well as heat production; and, in order to show that vegetable food is better adapted than animal for contributing to the performance of muscular work, reference has been made to our beasts of burden, which, as is well known, belong almost exclusively to the herbivorous tribe. That carnivorous animals, however, are not unsuited for such purpose is proved in the case of dogs, which, in some northern and other countries, are very extensively employed for the performance of work. To regard man's maintenance too closely in association with the mere performance of mechanical work — to look upon him, in other words, as though he were solely designed for the conversion of food into mechanical power — is not, it may be also said, taking a high view of his position. The prevailing tendency, certainly in the England of the present day, is to give an undue weight to the value of animal food, and this has been encouraged by the teachings of Liebig regarding the origin of muscular power — teachings which, during the last few years, have been shown to be untenable. Many people seem to look upon meat almost as though it formed the only food that really nourished and supplied what is wanted for work. The physician is constantly coming across an expression of this view. Undoubtedly a greater feeling of satiety is produced by meat than by other food. It forms a greater stay to the stomach, but this arises from the stomach constituting the seat of its digestion, and a longer time being occupied before it passes on and leaves the organ in an empty condition. Against those who think that a large consumption of meat is a *sine quâ non* for the maintenance of health and strength, the experience of vegetarians may be adduced. In the effects of the Scotch prison dietaries, corroborative testimony is afforded. Dr. J. B. Thomson, for instance, resident surgeon to the General Prison for Scotland, writing in the *Medical Times and Gazette*, Vol. I., 1868, speaks in favor, from ten years' experience, of a diet into which meat entered very sparingly, and which contained instead a moderate amount of milk. He says, since the employment of the improved dietaries sanctioned by the Secretary of State in 1854, the dietary in the General Prison for Scotland for all adult male prisoners, under sentence of nine, and not exceeding twenty-four months, had consisted of bread, oatmeal, barley, 1 oz. of meat per diem, made into soup, with succulent vegetables, and 20 oz. of skimmed or butter milk. One day in the week fish had been substituted for the soup. The health of the prisoners had been uniformly good. Weighing on admission and liberation had been carried out, and 88 per cent. were found to have gained or maintained their weight. Again, as shown by one of Dr. E. Smith's reports, it is not uncommon to find, amongst the agricultural laborers of Scotland, that no meat is consumed, oatmeal and milk forming their staple articles of diet. Further, Dr. Guy, from his observations in the case of English prisons, gives as one of his deductions "that we possess conclusive evidence of the sufficiency of a diet from which meat is wholly excluded, and even of a diet consisting wholly of vegetable matter."

I have introduced these particulars, not for the purpose of showing that a diet without meat is to be considered desirable, but for strengthening the argument that the consumption of meat to the extent that many persons believe necessary for the maintenance of health and strength is not in reality so. It has been before stated that physiological considerations point to a mixed diet as being most in harmony with our nature, and it may probably be considered that the most suitable admixture contains about one fourth, or rather more, of animal food. With more animal food than this, the excretory organs are unnecessarily taxed, and the system exposed to contamination with impurities, for the nitrogen of the superfluous nitrogenous matter has to be eliminated, and is found to escape, in combination with other elements, under the form of certain excretory products, without having contributed to any useful purpose. A defective transformative and eliminative action will lead to a retention of the products of metamorphosis of this superfluous nitrogenous matter in the system, and there is reason to believe that gouty affections, and other morbid conditions, are sometimes induced in this way.

A LIVING AUTOMATON.

We find the subjoined interesting account in *Galignani's Messenger* for July 25, 1874, sent us by a friend in Paris: —

A very curious patient is just now an inmate of Dr. Mesnet's ward at the Hôpital St. Antoine. His profession was that of a singer at the *Cafés Chantants*. During the war of 1870–71 he was hit over the left ear by a musket-bullet, which carried off about 2½ inches of the parietal bone, and laid bare

the brain on the left side. This led to a temporary paralysis of the members on the opposite side, as is always the case; but he was eventually cured of this, while the tremendous wound on the skull began to heal, so that after a time he could resume his professional duties at the Cafés to the satisfaction of the public. Suddenly, however, he was seized with nervous symptoms, lasting from 24 to 48 hours, and of such an extraordinary nature that it was considered safe to take him to the hospital. His malady is easier to illustrate by examples than to define. When he is in his fit he has no sensitiveness of his own, and will bear physical pain without being aware of it; but his will may be influenced by contact with exterior objects. Set him on his feet, and, as soon as they touch the ground, they awaken in him the desire of walking; he then marches straight on, quite steadily, with fixed eyes, without saying a word, or knowing what is going on about him. If he meets with an obstacle on his way, he will touch it, and try to make out by feeling what it is, and then attempt to get out of its way. If several persons join hands and form a ring around him, he will try to find an opening by repeatedly crossing over from one side to the other, and this without betraying the slightest consciousness or impatience. Put a pen into his hand; this will instantly awaken in him a desire of writing; he will fumble about for ink and paper, and, if these be placed before him, he will write a very sensible business letter; but, when the fit is over, he will recollect nothing at all about it. Give him some cigarette-paper, and he will instantly take out his tobacco-bag, roll a cigarette very cleverly, and light it with a match from his own box. Put them out one after another; he will try from first to last to get a light, and put up, in the end, with his ill-success. But ignite a match yourself, and give it him; he will not use it, and lets it burn between his fingers. Fill his tobacco-bag with anything, no matter what, shavings, cotton, lint, hay, etc.; he will roll his cigarette just the same, light and smoke it, without perceiving the hoax. But better still: put a pair of gloves into his hand, and he will put them on at once; this, reminding him of his profession, will make him look for his music. A roll of paper is then given to him, upon which he assumes the attitude of a singer before the public, and warbles some piece of his repertory. If you place yourself before him, he will feel about on your person, and, meeting with your watch, he will transfer it from your pocket to his own; but on the other hand, he will allow you, without any resistance or impatience whatever, to take it back again.

MEDICAL MEMORANDA.

The Cause of Hay Fever. — Dr. C. H. Blackley, of Manchester, England, to whose book on "Hay Fever" we have before made some casual reference, writes to the *Philadelphia Medical Times* as follows: —

"At the time my volume went to press I had not seen or heard of Dr. Wyman's book on 'Autumnal Catarrh.' I have, however, since then read it carefully, and have been much interested with the cases he has collected, and with the numerous facts he gives in connection with these; but, contrary to what your reviewer says would be the case, my reading it has not altered my views on the cause of hay fever, but has helped very much to strengthen the opinions I previously held. So far as I could gather from his book, Dr. Wyman had, when he wrote, no idea of the real nature of the cause of either hay fever or autumnal catarrh, and from a correspondence I have had with him since he read my book (whilst over in England) I judge that he believes the cause of the latter disease to be 'still a mystery.' Our 'June cold' or 'summer catarrh' (hay fever) is undoubtedly due to the pollen of grass; and after a careful perusal of Dr. Wyman's book I am convinced that American autumnal catarrh and English hay fever are one and the same disease, and due to the same cause, — namely, pollen; the one to the pollen of grass, and the other to the pollen of Indian corn, which latter, according to Dr. Wyman's book, flowers just at the time your autumnal catarrh is most prevalent.

"A few well-conducted experiments tried on the same plan as some of those described in my book would go far to settle this question; and if some of your physicians or laymen who are affected with this disorder will devote themselves to the work for a single season, I have very little doubt that the facts gathered in your own country will be found to support the conclusions I have arrived at by the experiments I have gone through in England."

Treatment of Headache. — Dr. Lauder Brunton, in a paper "On the Action of Purgative Medicines," recently published in the *Practitioner*, writes: "The administration of a brisk purgative, or small doses of Epsom salts, thrice a day, is a most effectual remedy for frontal headache when combined with constipation; but if the bowels be regular, the morbid processes on which it depends seem to be checked, and the headache removed even more effectually, by nitro-hydrochloric acid or by alkalies, given before meals. If the headache be immediately above the eyebrows, the acid is best; but if it be a little higher up, just where the hair begins, the alkalies appear to me to be the more effectual. At the same time that the headache is removed, the feelings of sleepiness and weariness, which frequently lead the patients to complain that they rise up more tired than they lie down, generally disappear."

Quinine in Small-Pox. — The *Journal des Débats* informs us that the Italian traveller and naturalist, Odoardo Beccari, writes from the Aru Islands, south of New Guinea, which he has visited for botanical and zoölogical purposes, and where he has made most interesting observations, that the small-pox is raging in all the towns of the Indian Archipelago, but that the Dutch treat it, and — which is much more important — cure it, with quinine. Taken in strong doses of from 60 to 100 grains English, the action of quinine renders the course of the disease extremely mild, and causes the suppuration to take place abundantly, freely, and with little or no suffering. In the Dutch hospital at Amboyna 300 patients were thus treated with quinine. Two only died. Beccari, who caught the disease, employed the same remedy in exactly the same manner, with the most favorable and speedy results. Cincho-quinine, of course, would answer the same purpose.

Carbuncle treated by Carbolic Acid. — Dr. Peter Eade writes, in the London *Lancet*, that he has found the action of carbolic acid in carbuncle constantly beneficial. He uses one part of acid to four or five of oil or glycerine. He thinks the efficacy of the solution is limited almost absolutely to those parts with which it could be brought into actual contact; and, although it appears occasionally to have produced injurious effects when used in large quantity, he has kept a large sloughing and granulating surface, for days together, constantly covered by the carbolized oil without any harm arising, although the urine soon presented the peculiar blackish color which has been several times observed during its employment.

SELECT FORMULÆ.

Powdering Camphor. — According to *The Pharmacist*, the most efficient substance to keep camphor in a finely-divided condition is glycerine.

Camphor	6 ounces.
Alcohol	5 fluid drachms.
Glycerine	1 fluid drachm.

Mix the glycerine with the alcohol, and triturate it with the camphor until reduced to a fine powder.

Preparation of Aromatic Powder. — Mr. J. L. Lemberger recommends the following method: —

Crush the ginger and separate the fibre with a coarse sieve, then crush the cardamom and separate the capsule from the seeds (for which purpose I find a coarsely perforated cullender the best suited); then mix the crushed ginger and cardamom with carefully selected cinnamon bark, and either with an iron mortar and pestle, or drug-mill, reduce to powder that will pass through a moderately fine sieve. Then mix with it the nutmeg, previously crushed, and pass the whole through the same process of powdering. Nutmeg, being very oily, resists pulverization when manipulated alone, but when mixed with the other ingredients, previously powdered, it acts very kindly. The powders absorb the oil and dry the nutmeg.

Syrup of Borax. — The following is commended by the *Cincinnati Lancet* for laryngeal catarrh: —

Borax	4 dr.
Syrup simp.	10 oz.

Dissolve by the aid of heat. A teaspoonful to be taken from 7 to 10 times a day, and swallowed without dilution. Avoid drink immediately after, so as to prolong the contact of the remedy.

Cincho-Quinine. — The following letter from P. L. Tanner, M. D., Coalton, Boyd County, Ky., under date of August 1, 1874, needs neither introduction nor comment: —

"I had one case of fever of remitting type, generally known by the name of *congestive fever*. If neglected, or improperly treated, it would have terminated fatally. In the treatment of the disease, I recognized three indications: (1) To relieve the engorged or congested organs; (2) To moderate the excessive febrile reaction; (3) To break up the train of morbid associations. The entire reliance was placed on the following compound: Cincho-quinine, gr. iij.; sulph. mor. gr. ½; ipecac, gr. ij. — given every two hours. I used stimulating applications of brandy and capsicum to the extremities. I also regard cincho-quinine as essential to the cure, and administer that article whether there is an intermission or not, regarding a remission as a sufficient indication for its employment. I had four cases of intermittent (quotidian) fever, which were successfully treated with the cincho-quinine. In all cases of congestive fevers, I find it will not answer to keep up a free action of the bowels; only slight action is necessary. Free action has a tendency to increase congestion.

"I have practised my profession for the last thirty-six years in this part of Kentucky. In all my observation and experience I have never met with a more safe and efficient therapeutic agent in fevers of any type."

Mr. S. J. Small, druggist, Carmel, Ind., writes as follows, July 23, 1874: —

"I introduced your cincho-quinine here about the 1st of June, and have since sold some 40 or 50 ounces. I think it will entirely take the place of the sulphate."

J. Burbeck, M. D., of Canajoharie, N. Y., in a letter dated August 3, 1874, says: —

"I have for the last three years used more of the cincho-quinine than of the sulphate of quinine, and I have far greater confidence in the former as a remedial agent."

L. R. Wisner, M. D., of Jonesville, Mich., writes, August 4, 1874: —

"I have used your cincho-quinine for two years in a large practice in a malarial district. I commenced its use with great caution, but it has proved itself worthy, and during the past year I have used ten bottles of cincho-quinine to one of sulphate quinine. I consider the former the better medicine."

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Familiar Science.

OUR WATER ATMOSPHERE.

A YEAR ago, we devoted an article to "Some Facts Concerning Rain," especially those illustrating its very unequal distribution, even within the limits of a single small country, like England. We promised that at some future time we would give the explanation of these singular phenomena, but it may be well to prepare the way for the fulfilment of the promise by a few remarks on the moisture of the atmosphere.

The gaseous envelope surrounding the earth may be considered as a double one, made up of an atmosphere of dry air and an atmosphere of vapor. The dry air is always a gas, and its quantity is constant from year to year; but the vapor of water does not always remain in the gaseous state, and the quantity present in the atmosphere is incessantly varying. Vapor is continually passing into the air from the surface of water and moist bodies, and even from that of snow and ice, by the process of evaporation. Air can, however, contain only a certain amount of vapor, which increases with the temperature. When it is saturated with moisture, evaporation ceases; and on the other hand, evaporation will be greatest when the air is perfectly free from vapor. Since atmospheric currents remove the saturated air and replace it with dry air, evaporation is much more rapid in windy than in calm weather.

It is well known that when a liquid passes into the gaseous form a large quantity of heat becomes *latent*, and that this heat becomes *sensible* again when the vapor returns to the liquid state. The ocean loses more heat from evaporation than the land, because the quantity evaporated from its surface is much greater. Again, since more rain falls on land than at sea, especially in hilly and mountainous countries, the temperature of the air over the land will be still further raised by the heat thus given out. This is one of the reasons why the average temperature of the northern hemisphere is higher than that of the southern.

It is for this reason that the sensible temperature depends on the moistness of the air. Dry air promotes evaporation from the surface of the body, and seems cold; while moist air impedes this evaporation, and seems warm. When the air is both hot and moist, as in the dog-day season, it is peculiarly oppressive. It is because the winds promote evaporation that the air seems cooler on a windy day than on a still one, though the temperature may be the same.

After the sun has set, the earth is continually radiating heat into space, and is receiving little or none in return. As it cools down, it cools the layer of air in contact with it, and causes it to deposit its moisture in the form of dew, just as in hot weather it collects on the outside of a pitcher of ice-water. The cold surface of the pitcher cools the air nearest it so much that it has to give up a part of its moisture. Dew collects on some substances more readily than on others because they are better radiators, and therefore cool sooner. It does not collect on a cloudy night, or under a roof or shed, because the heat is sent back by the clouds and the roof as fast as it is radiated from the earth. There is no dew on a very windy night, because the layer of air near the earth is continually changing, and does not become cool enough to give up its moisture.

The ascertaining of the dew-point is of great practical importance, particularly to horticulturists, since it shows the point near which the temperature during the night will cease to fall. For when the air has been cooled down by radiation to this point, dew is deposited, heat is given out, and the temperature of the air rises. But as the cooling by radiation proceeds, the air again falls to, or slightly under, the dew-point; dew is now again deposited, heat liberated, and the temperature raised. Thus the temperature of the air in contact with plants and other radiating surfaces gently oscillates about the dew-point. For if it rises higher, the loss of heat by radiation speedily lowers it, and if it falls lower by ever so little, the heat liberated by the formation of dew as speedily raises it. The dew-point, then, determines the minimum temperature of the night; and if this point be found by means of a hygrometer, the approach of low temperature or of frost may be foreseen and provided against.

Mists and fogs are visible vapors floating in the air near the surface of the earth. They are produced by the mixing of cold air with air that is warm and moist, or by whatever tends to reduce the temperature of the air below the dew-point.

During a calm, clear night, when the air over a level country has been cooled by radiation, and dew begun to be deposited, the portion of the air in contact with the ground is lowered to the dew-point, and thus becomes colder than the air above it. Since there is nothing to disturb the equilibrium and give rise to currents of air, or to reduce the temperature much below the point of saturation, the air within a few feet of the surface remains free from mist or fog. But if the ground slopes, the cold air, being heavier, flows down and fills the lower grounds; and being colder than the saturated air which it meets with in its course, it will reduce its temperature considerably below the point of saturation, and thus produce mist.

When an oceanic current meets a shoal in its course, the cold water of the lower depths is brought to the surface, and if its temperature is lower than the dew-point of the air, fogs are formed over the shoal. For a similar reason icebergs are frequently enveloped in fogs, and mist is sometimes seen to rise from rivers whose temperature is lower than that of the air. The Swiss rivers which issue from the cold glaciers cool the air in contact with them below the point of saturation, and mist is thus often produced; as also over rivers which, like the Mississippi, flow directly into warmer latitudes, and are therefore colder than the air above them. On the other hand, when rivers are considerably warmer than the air, they give rise to fogs, because the more rapid evaporation from the warm water pours more vapor into the atmosphere than it can hold, and the surplus is condensed by the colder air through which it rises. Thus deep lakes, and rivers flowing out of them, are in winter generally much warmer than the air, and hence when the air is cold and very moist they are covered with fogs.

The densest fogs occur during cold weather in large towns built on rivers. The peculiar denseness of the London November fogs is caused by the warmth of the river-bed, and it is increased by the sources of artificial heat which the great city affords; and since the temperature is falling everywhere, and the humidity is then great, the vapor of the atmosphere is quickly and copiously condensed by the cold easterly winds which generally prevail in November.

Mountains are frequently covered with mist. As warm air is driven up the sloping sides by the wind, it becomes gradually colder, and its capacity for moisture is diminished until condensation takes place. Mists often appear sooner on the parts of hills covered with trees than elsewhere; especially when the mist begins to form after midday, because then the temperature of the trees is lower than that of the grassy slopes. Sometimes the summit of a hill or an isolated peak is swathed in mist, while elsewhere the atmosphere is clear; and though a breeze be blowing over the hill, still the cloudy banner clings there instead of floating away with the wind. The explanation of this phenomenon is simple enough. The temperature at the top is below the dew-point of the atmospheric current. Hence when the air rises to this region its moisture is condensed into mist, which is borne forward over the top of the hill and down the other side, gaining heat as it descends, till it is again dissolved and disappears. Meanwhile its place is constantly supplied by fresh condensations, and thus, though the mist on the top of the hill appears to remain motionless and unchanged, the watery particles of which it is composed are continually undergoing renewal.

Clouds are visible vapors floating high in the air, differing in no other respect from mists and fogs, which float near the surface. During the warmest part of the day, when evaporation is greatest, warm, moist air-currents are constantly ascending from the earth. As they rise higher and higher, they at length reach a point where they can no longer retain the moisture with which they are charged; hence condensation takes place, and a cloud is formed, which increases in bulk as long as the air continues to

ascend. But as the day declines and evaporation is checked, the ascending current ceases, and, the temperature falling from the earth's surface upwards, the lower stratum of air contracts, and consequently the whole mass of air begins to descend, and the clouds are then dissolved by the warmth they acquire in falling. The whole of this process is frequently seen on a warm summer day. "In the morning the sky is cloudless, or nearly so; as the heat becomes greater, clouds begin to form before noon and gradually increase in numbers and size; but, as the heat diminishes, they contract their dimensions, and gather round the setting sun, lit up with the fiery splendors of his beams. In a short time they disappear, and the stars come out, shining in a cloudless sky."

Moreover, the whole atmosphere, to a great height, is constantly traversed by aerial currents, one above another, and flowing frequently in opposite directions. Masses of air of different temperatures are thus often mixed together; and since when mingled they cannot hold the same quantity of vapor that each could retain before they were united, the excess is condensed and appears as cloud.

The reader may ask how it is that these clouds are suspended in the air, and the explanation we have given of the misty banner clinging to a mountain peak may suggest the answer. The cloud itself may appear stationary or suspended, but the particles of which it is composed are continually changing. The particles are upheld by the force of the ascending current in which they are formed; but when that current ceases to rise, or when they become separated from it, they begin to fall through the air by their own weight, till they melt away and are dissolved in the higher temperature into which they fall. Hence, as Espy has reasoned, "every cloud is either a forming cloud or a dissolving cloud." While it is connected with an ascending current, it increases in size, is dense at the top, and well defined in its outlines; but when the ascending current ceases, the cloud diminishes in size and density. When a cloud overspreads the sky, its lower surface is generally horizontal, or rather it seems to conform to the contour of the earth's surface beneath it. This is because the high temperature of the air below the cloud is sufficient to dissolve the particles as they descend below its level.

The length to which this article has extended forbids our going on to give the classification of clouds, to which, however, we may refer at another time. The facts already stated concerning the moisture in the atmosphere will serve as an introduction to what we wished to say about rain, and that subject we hope to take up in our next number.

CHEMICAL CHIROGRAPHY.

Some kinds of writing are not chemical processes, and some kinds of ink do not owe their property of staining paper to chemical principles. In writing with a lead-pencil, for instance, a portion of the "lead" or graphite is simply rubbed off by the friction, and the fine particles adhere to the paper, precisely as when we scrawl with charcoal or chalk on a board. When the charcoal is used, indeed, the process is virtually the same as writing with the lead-pencil, for the graphite, as the reader is doubtless aware, is nothing but a form of charcoal or carbon. India ink and printers' ink, likewise, are merely mixtures of carbon with materials that give it an adhesive quality. The countless kinds of ordinary writing ink, on the other hand, owe their color to a chemical combination, not to a simple mechanical mixture, and the change in color that occurs in many of them after being applied to the paper is a chemical change, as is that which takes place in so-called indelible inks when the writing is exposed to sunlight or pressed with a hot iron.

But the most striking examples of chemical writing are afforded by what are commonly called "sympathetic inks," characters written with which may be made visible or invisible as one pleases. They have a certain practical value for purposes of secret correspondence, but are chiefly interesting as curious chemical experiments. Their action in all cases depends upon chemical changes that take place in the ink after it has been applied to the paper; and these changes are brought about either by light or heat or by the action of some gas or solution.

For instance, if we write with a very dilute solution of chloride of copper, which has scarcely more color than pure water, the characters are invisible; but if gently heated they become distinctly yellow, and are easily read. Let the paper cool, and they vanish; and they may be made to appear and disappear an indefinite number of times. If heated too strongly the compound is decomposed, and the writing becomes permanently brown from the deposition of the copper. The chloride of copper may be conveniently made by mixing solutions of ammonic chloride (sal-ammoniac) and of cupric sulphate (blue vitriol). We remember making it in our boyhood by precipitating the copper from a solution of blue vitriol by putting a bit of zinc into it, and then dissolving the finely divided metal in muriatic acid.

The change of color in this and kindred cases is due to the removal of the water of crystallization by the heat. In chemical combination with the water the salt is transparent; without the water it is opaque. The salt, being very deliquescent (as you will find if you try to prepare it in a crystalline form), rapidly absorbs moisture from the air when cool.

A weak solution of nitrate of copper forms a red sympathetic ink; that is, the writing becomes red when heated. A solution of chloride of cobalt produces a faint pink writing, which becomes colorless when perfectly dry. When heated it appears green, but fades out again on cooling. Dampness renders it visible as a pink, and a very strong heat as a brownish red. A solution of bromide of copper is one of the best of this class of inks, becoming light brown under the influence of a gentle heat. The salt may be made by dissolving one part of potassic bromide and one of blue vitriol in eight parts of water.

There are many other salts which afford inks acted upon by heat, and there are various more familiar substances which are affected in a similar way. Among these are milk, onion juice, and lemon juice, all of which have been used for secret writing. The salts, however, are preferable if they can be obtained.

It is necessary to use perfectly white paper with these chemical solutions, as most of them will remove the color from blue and other tinted papers, leaving the writing permanently white on a colored ground. Highly glazed paper is also objectionable, as the characters can be discerned even when colorless, on account of the action of the liquid on the glazing.

Inks that are rendered visible by the action of light are mainly solutions of silver salts, such as are employed in photography. They require more care in manipulation than the inks already mentioned, and are therefore not so good for amateur experiments. The writing must be done by gas, lamp, or candle light, and must not be exposed to daylight until it is intended that it should become visible. It cannot be rendered invisible again by mere removal to a dark place; but this may be effected in the case of some of these inks by washing with a solution of bichloride of mercury, as the so-called "magic photographs" are treated.

The other forms of sympathetic inks, some of which are more interesting than those already described, would require more space than we can give to the subject in the present number, and we therefore leave them till another month.

STRASBURG GEESE AND PIES.

We have never seen a better description of the fattening of geese in Strasburg for the *pâtés-de-foie-gras* which have made that city famous throughout the world, than the following from a recent number of the *Pall Mall Gazette*:—

Their proprietor explains that they are all nine months old, and have cost him, lean as they are, about 2 fr. 50 c. apiece; he then makes a sign to half a dozen bare-armed girls, who speak no French, and amid considerable commotion and protest from the remaining 94, six geese are collared and marched away to a cellar half underground, where wide and sloping stone tables are arranged in tiers so far as the eye can see. In the murky light thrown in by some twenty air-holes, one can at first distinguish nothing; but by and by it becomes apparent that hundreds of geese are already lying strapped on their backs on the upper tiers, and gasping hysteric things — probably words of love and encouragement — to one another. Our business being for the moment at the lower tables, the six girls take each her goose, lay him gently but firmly on the stone, so that his tail just projects over the ledge, and then tie down his wings, body, and legs tight with plaited whipcord, the legs and wings being well spread out to paralyze anything like vigorous gymnastics. The bird's neck is left free, and it seems that during the first three days he makes a violent use of it; but towards the fourth day he arrives at the consciousness that by struggling and croaking he does nothing to amend his lot, and from that time he may be trusted to lie still for the next seven weeks; that is, till the hour of release and killing. Without pausing to see all the hundred geese tied down, we may go on at once to the upper tiers, where the birds that have been lying for three, five, or six weeks respectively are taking their ease, and waiting to be fed by half a dozen other Alsatian girls laden with large wooden bowls. Each of these bowls is filled with a thick white paste, made of parboiled maize, chestnuts, and buckwheat, most nourishing; and the mode of administering the dinner is for the girl to catch the goose by the neck, open his bill with a little squeeze, and then ram three or four balls of the paste down his throat with her middle finger. The goose, having been thus refreshed, resumes his slanting position and digests till the next time for feeding, which arrives about two hours after, the meals being about six a day. But now we have done with the women, for a pensive man — a con-

noisseur of the obesity of geese — breaks upon the scene, climbs upon the topmost tier of all, and proceeds to examine the birds that may be "ripe." He has an eye as judicious as that of a gardener inspecting melons; and his is the responsible task of pronouncing what birds would die of natural death within twenty-four hours, if not dispatched beforehand. If a goose dies of natural death he is good for nothing. He must be unstrapped and executed at the precise psychological moment when Nature is growing tired of supporting him, and the knack of detecting that moment can only come of long practice, and fetches the possessor wages as large as those of a diamond valuer. Our pensive functionary has not been a minute on the table before he certifies four geese ready for the slaughter. All four of them have stomachs of the size of pumpkins, and from what one can gather of their broken remarks, it is a sincere relief of these when a couple of male acolytes climb up, loose their bonds, and bear them out of the cellar to a pent-house across the yard, full of knives and chopping-blocks. A click with the chopper on the neck of each, a rip with the knife, and, in less than five minutes after their transfer, the carcasses of the four victims are lying in a heap, while their livers are being conveyed with all respect and care to the truffling-house. The carcasses, shrivelled out of all knowledge, are sold for about 8 d. apiece to peasants, who make soup of them; the livers are first cleaned, then put to scale, and our four geese are declared grand birds all of them, for their livers weigh from 2½ to 3 lbs. each. The next step is to take each liver and to lard it with truffles, in the proportion of ½ lb. of truffles to 1 lb. of liver, and then to convey it to an ice-house, where it remains on a marble slab for a week, that the truffle perfume may thoroughly permeate it. At the end of a week each liver, being removed, is cut into the size required for the pot which it is to fill, and introduced into that pot between two thin layers of mincemeat, made of the finest veal and bacon fat, both truffled like the liver itself, and one inch's depth of the whitish lard is then spread over the whole, that none of the savor may escape in baking. The baking takes about five hours, and absorbs all the energies of four intelligent Frenchmen in white, who relay each other, to see that the fire never blazes too high or sinks too low. When the cooking is over, nothing remains but to pack the dainty either in tin or earth or wood, according as it may be needed for home or foreign consumption, and to ship it to the four points of the compass. A question may here arise as to how many geese die naturally before the above processes can be carried out to a happy end; but it is a pleasing fact that few geese die, and those only ill-regulated birds which had unsound constitutions or no ambition for high destinies. It is on record, however, that a member of the Society for the Suppression of Cruelty to Animals once arrived in Strasburg, armed with the Larochefoucauld law, and endeavored to cope with the pie factors; but he was worsted, and there are strong reasons for suspecting that he was a Socialist.

PRESERVING FERNS.

A WRITER in the *English Mechanic* gives the following directions for this kind of botanical work: —

"In the autumn, and before the spore-cases or seed-vessels have ripened, cut the frond off close to the root. Wash in clean cold water, by simply dipping and moving the frond in the water. Provide yourself with two planed boards, about half an inch thick, a foot and a half long, and a foot wide, one or two quires of ordinary white demy paper, and a couple of strong leather straps. Place the specimens between the sheets of paper, then place the whole between the two boards and draw the straps tightly round. Change the paper now and then, drying one set of papers while the other set is being employed in the pressing. In the case of small specimens the root as well as the fronds may be dried and preserved. In your 'fern album' use ordinary cartridge-paper, bound like scrap albums, so that when the specimens are affixed, the book will present a uniform thickness. In affixing your specimens use small straps of gummed paper. It is much better than gumming the specimen itself."

On this last point, however, there may be a difference of opinion, and for the benefit of those of our readers who prefer the other way of mounting the ferns we add the following directions for the process, from another writer: —

"After pressing the ferns, lay them aside for a day or two previous to mounting. To do this, smear the sheet of paper over with liquid gum, lay the reverse side of the frond on the gummed surface, press gently, remove, and place carefully on the paper where you intend it to remain. Finally pass over a piece of blotting-paper to remove creases."

FAMILIAR SCIENCE NOTES.

A NEW FORM OF ELECTRO-MAGNET. — A contributor to the *English Mechanic* thus describes an electro-magnet constructed upon a novel plan and possessing a power far greater than those of the ordinary type: —

"First, I took a number of pieces of iron wire, 16-gauge and 12 in. long, and commencing half an inch from the end, I wound fine silk-covered wire (as used for the secondary in coils), for 2½ in. down, then gave two or three long turns, carrying the wire to within 3 in. of the other end, and wound that in the same manner as the first, and leaving long ends of the fine wire for subsequent attachment. The covered wire was then dipped in a spirit varnish and put aside to dry. When I had covered a number of these I bent them up into the form of a horse-shoe magnet, and put round them a number of pieces of similar wire, but uncovered, so that I had a horse-shoe magnet much resembling the bundle of wire in the core of a 'coil.' The whole lot were then wound with 8 coils of 16-gauge covered wire in the usual manner, and all the ends of the fine wires soldered to the outside copper wire. The result quite surprised me, and no doubt will be of some use to those who do not mind a little trouble for the sake of a superior article."

A HUMBLE BOTANIST. — Among the many eminent botanists in Scotland, there are few who have attained a more thorough knowledge of plants and flowers than James Wellwood, hand-loom weaver, Parkhead. We find an interesting account of him in a late Glasgow paper. When quite a young man, he turned his attention to the science of botany, and occupied his leisure hours during the summer season in gathering wild plants and flowers in the surrounding neighborhood. He afterwards extended his researches to the adjacent counties, with the view of obtaining additional information on the subject. During holiday seasons, when many of his brother craftsmen were frittering away their time in frivolous enjoyment, this humble disciple of Linnæus might be found picking up plants and flowers among hills and glens, in the tangled copse, or on the banks of some quiet stream, far from the din and bustle of the city. Though unobtrusive in his manner, and of a retiring disposition, James nevertheless attracted the notice of some of the most distinguished botanists in the West of Scotland, who kindly favored him with the best works on the subject, and these he has perused to excellent advantage. He is familiarly acquainted with the common and technical names and distinctive qualities of every class of plants in Scotland, and also many exotics. Lecturers on the subject frequently consult him on some disputed point, and almost invariably they find his opinion to be correct. James Wellwood, though now in the "sere and yellow leaf," is as enthusiastic on the subject of botany as when he first turned his attention to it, some half a century ago.

ARTIFICIAL BIRDS'-NESTS. — A writer in *L'Illustration*, referring to the Bois de Vincennes, says: "They are placing this year, as they did last year, a great number of artificial nests in the clumps and thickets of this wood. Were you aware that there existed in Paris workwomen skilful enough to fabricate nests so admirably constructed as to take in (in more than one sense) the very birds themselves? They make them for the thievish and quarrelsome sparrow, for the titmouse with the azure tail, for the warbler, for the kingfisher (there are large artificial lakes in the Bois de Vincennes), and for the chaffinch. The cuckoo, the blackbird, and the magpie himself are not forgotten. Such beautiful nests! Large and small apartments for feathered families to be let, with immediate possession, without taking a lease, or with a lease of three, six, or nine years, at pleasure." These, by the way, are the usual terms of leases in France. The writer goes on to state that three thousand of these nests have been put up. The plan, we believe, was first suggested by a professor of the Jardin des Plantes, with a view to encouraging the multiplication of birds that may help to destroy worms and insects injurious to vegetation.

PURE AIR AND LICHENS. — A Paris paper says that a curious fact has been lately pointed out to the French Institute by M. Cosson, a botanical member of that learned body; namely, that lichens require for their development very pure air. He considers, indeed, that they are very delicate natural tests of the purity of the atmosphere. In Paris no lichens are found in the garden of the Tuileries, whilst they are found in that of the Luxembourg. We ought thence to conclude, with M. Cosson, that the quarter in which this latter garden is situated is a more healthy residence than the neighborhood of the Tuileries. *The Gardeners' Chronicle*, commenting on this notion, suggests that the humidity of the air, as well as its purity, is one of the conditions of the development of lichens. From what we know of Paris, however, we do not see why the air in the Luxembourg garden should be moister than in that of the Tuileries. The former is on higher ground, and is also at a considerable distance from the Seine, which flows close beside the latter.

DISTILLING SEA-WATER. — The author of a book lately published in England, entitled "Two Years in Peru," thus describes a simple contrivance recently devised by an English resident of that country for procuring fresh-water from sea-water through the direct action of the sun's rays: —

"The apparatus consists of a box of pine-wood, 1 inch thick, and which is about 14 feet long, 2 feet wide, and an average depth of six inches. The upper part of this box is closed with ordinary glass, which has an inclination of 1½ inch.

"At the lower edge of the glass there is a semi-circular channel, destined to receive the fresh-water which is condensed on the interior surface of the glass. The salt-water is let into the box to about 1 inch in depth. It is then exposed to the rays of the sun, the heat of which is sufficient to raise it to 65° or 70° Centigrade. A very active evaporation then begins, and it is proved that a square metre of glass will condense daily two gallons of pure water."

The author says he saw the apparatus in successful operation at Callao. There are many places on the coast of Peru, as in various other parts of the world, where fresh-water is only to be got by distillation, and in such localities the device cannot fail to be exceedingly useful.

Practical Chemistry and the Arts.

QUANTITATIVE SPECTROSCOPY.

In the course of the Cantor Lectures, Mr. Lockyer gave a full account of the application of the spectroscope to the quantitative analysis of alloys. The principle upon which this is founded is as follows: If the spectroscope is placed so as to observe the light produced by the electric spark passing between two poles, one of carbon, the other of any metal, we at once get the lines due to that metal. These were thoroughly examined by Bunsen and Kirchhoff. If now, instead of examining this light directly, it is allowed to fall upon a convex lens, and the slit of the spectroscope is placed in the focus of the lens, the exact image of the source of light instead of the diffused light may be examined. Thus far, nothing has been done beyond what has already been done with the telespectroscope, in which the sun itself, instead of its diffused light, is examined. On examining the spectrum of a metal volatilized in the electric lamp, it will be found that the lines are not continuous across the spectrum. Some extend from one pole to the other, but many of them extend only a short distance from the pole at which the metal to which they are due is being volatilized. This is accounted for by the fact that the vapor of the metal is much more dense at the pole than farther away; and it is a well-known fact that the more dense the vapor, the more lines it produces.

This readily accounts for the absence of lines in the solar spectrum due to a metal which is known to exist there. For instance, the spectrum of aluminium consists of two long lines in the violet and a great many short lines in other parts of the spectrum, that is, in the spectrum obtained at atmospheric pressure. Now suppose a line at the bottom of the spectrum to represent the upper surface of the sun's photosphere, and the aluminium vapor to exist above the sun's photosphere at atmospheric pressure. Then all the lines in the spectrum of aluminium will be reversed. But suppose that the vapor, instead of existing at the pressure of one atmosphere, is existing at the pressure of half an atmosphere. This is represented by dividing the spectrum by a line half-way down; this leaves only the two long lines above, and these will be the only ones reversed, for the others do not exist at that tension. If one of the poles is made of one metal and the other of another, we then have two different spectrums in view at once. If, for instance, lead and cadmium are used, some of the lead lines will go entirely across the spectrum, while the cadmium lines only reach about half-way across. If, then, these long lines are simply due to the fact that when the tension of the vapor is low we get a simple spectrum and the complexity of the spectrum increases with the density of the vapor, then it may be said that there is a great deal of calcium in the sun because the calcium lines are abundant, and very little aluminium because only a few of the aluminium lines are found.

From this it follows that if we get certain lines from a pure metal, we shall not get so many from one of its chemical compounds. For instance, taking the metal strontium and its chloride or iodide, the metal will give more lines than the compound. Now which lines ought to be obtained in the compound? Evidently the long lines, because the short lines are only given by the dense vapor. That is, a chemical combination by diluting the vapor has produced the same effect as diminishing the pressure.

Now if this is the effect of chemical combination, why not of mechanical mixture? Suppose, for instance, a substance gives a hundred lines; then if alloyed with a little of something else it will give only ninety-nine; if with still more, only ninety-eight, and so on.

Now these facts have been applied to the analysis of gold and copper alloys. All that has to be done in order to determine the amounts of these metals is to decide upon some particular conditions to be observed in each case. For instance, if the gold and copper lines were always of an equal height, and if the increase of any one constituent always carried them up or down, then we should measure simply the length of the lines. A difference of .0001 makes the alloy physically different, and among its varying properties is that of volatility; if it contains more copper it is more volatile, and if more gold it is less volatile. But it is not only less volatile as a whole, but the copper is less volatile than it was before and the gold more volatile than it was before, and so almost any changes that may be required are obtained by changing the alloy by .0001. Now the position of any particular phenomenon is determined with great accuracy by means of a micrometer eye piece. If then a record is made for a series of specimens containing known amounts of gold and copper, it becomes easy to compare unknown samples with these. In a number of trials the spectroscopic readings differed from the assays in only one case, and in this case a repetition of the assay showed that it was wrong and the spectroscope right. The mechanical arrangements for carrying out this method of analysis must of course be very accurate, and in practice the metals to the number of fifty or sixty are supported on the rim of a wheel which can be adjusted to the ten-thousandth of an inch. S.

ANILINE COLORS IN PHOTOGRAPHY.

Some very curious results have already been obtained by the use of aniline colors in photography. As yet, no great practical use for them has been discovered, but we anticipate that at no distant day some important results will flow from the numerous experiments now being made. The aniline colors are soluble in collodion, and may be employed to impart to it any desired tint; yet the effect of such collodion, when introduced into the silver bath, is to injure the latter, and until this disadvantage is overcome we can hope for nothing in that direction. There is, however, another field that promises a certain degree of usefulness to amateurs, copyists, and draughtsmen, if not to photographers themselves. It is well known that when a tracing or any drawing on thin and nearly transparent paper is placed in front of a sheet of sensitized silver paper, and exposed to the light, an accurate copy is soon obtained, in which the lights and shadows are reversed so that a white drawing on a black ground is the result. This operation is exceedingly simple and rapid, although not inexpensive. Unfortunately the copy thus obtained will not bear exposure to light, and even when carefully preserved in the dark it disappears entirely in a few weeks. To render it permanent the usual photographic process of toning with gold must be resorted to, and this is not only expensive, but so intricate and troublesome that amateurs seldom succeed with it, while practical men cannot afford the time necessary to accomplish it.

The fact that bichromated gelatine is rendered insoluble by the action of light has long been known, and forms the basis of all the various carbon processes, including the Woodbury and Albertype. By making use of this principle in connection with an aniline toning solution, it is possible to obtain perfect copies in any color, except perhaps black. The following formula is said to give quite satisfactory results. The paper is first floated on a bath of 1 part potassic bichromate, 10 parts phosphoric acid, and 10 parts water, for one minute, and dried in the dark. When dry the paper is exposed under a drawing for a short time, and then fumed with 1 part aniline dye in 16 parts benzole. The picture is fixed by washing. Unlike the silver process, the picture produced is not a negative, but a colored drawing on a white background. Mr. Hoppe, some of whose work was exhibited before the Berlin Photographic Society, stated that he had made a dozen copies of one drawing in an hour. As yet it has been impossible to obtain a clear white background, but Mr. Hoppe expects soon to remove that difficulty. The writer has also succeeded in making positive prints in rose aniline from photographs on glass and from opaque objects like leaves. In both cases gelatine was used instead of phosphoric acid, in combination with the potassic bichromate, and the prints toned by immersion in an alcoholic solution of rose aniline. Some difficulty has been encountered in obtaining sufficient contrast; so that the author is not willing to publish the details until the process is rendered more perfect.

From the nature of the chemicals employed and the few operations necessary, it seems highly probable that the process will find extensive use for making copies of autographs, letters, drawings, leaves, feathers, patterns for embroidery, and the like. For botanical purposes, aniline green could be employed to tone copies of leaves, while prints from the petals of flowers could be toned with some color corresponding to the original, and we are not sure that two or three colors could not be produced on the same print by applying the toning solution with a brush, very little skill or care being required.

In ordinary portrait photography we anticipate little if any success for aniline printing, as the common negative would need to be reproduced before it could be employed, and the effects would be less pleasing than with silver. It is, however, possible to introduce logwood and other pigments into the gelatine so as to produce a positive picture from the ordinary negative, and we have seen some successful prints of this sort. E. J. H.

LABORATORY NOTES.

The Action of Sulphuric Acid on Tricalcic Phosphate. — J. Kolb finds that when one equivalent of tricalcic phosphate is mixed with two equivalents of sulphuric acid of sp. gr. 1.535, the temperature rises to 120° or 150° C. At this temperature monocalcic phosphate is partially decomposed into pyrophosphate and phosphoric acid. The product was analyzed immediately after mixing, and at short intervals. It was found at first to contain much free phosphoric acid, which gradually diminished, while the monocalcic phosphate increased. The first action therefore would seem to be the liberation of phosphoric acid equivalent to the sulphuric acid employed; this in turn, acting on the undecomposed tricalcic phosphate, formed monocalcic phosphate.

The Action of Light on Vegetation. — J. Macagno has recently tried the effect of different colored lights upon beans. He obtained the following results: —

	Dry Substance.	Organic Matter.	Ash.
White Light,	0.534 grain.	0.452 grain.	0.082 grain.
Violet,	0.330 "	0.278 "	0.052 "
Red,	0.264 "	0.189 "	0.075 "
Yellow,	0.222 "	0.168 "	0.054 "

This hardly agrees with General Pleasanton's ideas in regard to the use of violet glass, for which he received a patent a year or two ago.

Analysis of Superphosphates. — The following plan was resolved upon at a conference of manufacturers at Magdeburg: 20 grams are shaken with a litre of water for two hours, or, if the sample contains much iron and alumina, for a few minutes only. The liquid is then filtered. If sodium acetate precipitates less than one per cent. of iron and aluminium phosphates, the phosphoric acid is estimated by titration with uranium nitrate. In other

cases it is estimated by precipitation with ammonium molybdate, solution of the precipitate in ammonia, and reprecipitation with magnesium chloride.

Test for Tin and Copper in Extracts. — Hager gives a method for testing for minute quantities of tin and copper in extracts, by means of a rod of zinc. The metals are precipitated upon the zinc, and may be dried, rubbed off, and tested further. A much neater way is to insert two platinum slips connected with a battery into the suspected liquid, which should be slightly acidified with sulphuric acid. In this way the metal may be obtained in a form in which it can be at once weighed.

MEMORANDA IN THE ARTS.

The Papyrograph. — This is the name given to an ingenious apparatus for copying letters and other writings, to be seen at the International Exhibition now open in London. It was originally the invention of an Italian named Zuccato, but has been patented by English parties. The document to be copied is written in an alkaline ink, on a prepared water-proof paper. This ink corrodes away the water-proofing material (which is applied only on one side), and, consequently, when the ink is washed away, the part on which the writing was is left plain, while the surrounding paper is water-proof as before. There is thus, therefore, a sort of stencil-plate formed of porous paper and water-proof paper. This sheet is then laid on a pad saturated with a certain chemical salt, and on the top of it is laid a sheet of paper saturated with another salt: pressure is applied, and the two salts being able to unite through the porous part of the intervening stencil-plate (as it may be termed), they there form a coloring matter which is deposited on the upper sheet in absolute *fac-simile* of the original writing on the stencil. This is accomplished by means of a frame, in which the pad, the stencil-paper, and the saturated sheet are held in proper position, and an ordinary copying press. About 300 impressions can be taken from each original, and these can be worked at an average rate of five a minute. The first impression can be obtained in less than ten minutes from the writing of the manuscript.

A Curious Clock. — In *Les Mondes* recently there was an engraving and description of a clock designed by M. Henri Robert, which consists simply of a transparent glass dial suspended by two cords from points in its border. It has the two usual hands, but these are apparently free from any machinery to carry them. If one moves either of the hands and then lets it go, it returns to its former position after a few oscillations. The hands are really moved by mechanism within them by means of which their centre of gravity is continually displaced. The clock is described as a new invention, but we recollect seeing one of similar construction while in Europe in 1872 — in Switzerland, if we are not mistaken.

Soldering Broken Files. — A writer in the *English Mechanic*, who had broken the only half-round file he had by him, says: "After trying to use the broken end (it was broken about the middle) I was about to give up in despair, when I thought I would try soldering it; and, to my surprise, it not only stood while I completed the small job I was then doing but is in use still, and will stand all the force such a file needs to have applied to it in ordinary use. I used ordinary solder, Baker's soldering fluid, and a Bunsen burner. The temper at the joining is not in the slightest altered. Of course I was careful not to heat it more than requisite to melt the solder."

A Desiccating Bottle. — At the London International Exhibition of the present year, Louis Cornelis, of Belgium, shows some bottles with desiccating stoppers, for preserving substances liable to be affected by damp. They are ordinary bottles with hollow globular stoppers containing a desiccating material, confined within the stopper by means of a piece of wash-leather tied over its lower opening, which admits of communication between the atmosphere of the bottle and that of the stopper.

A New Source of Leather. — A French patent has recently been taken out for the preparation of leather from tripe, intestines, and other animal membranes; these are soaked in milk of lime while still fresh, then washed and immersed in water, and finally in a paste made of starch and white of egg. The substance thus formed is to be used for glove-making, etc.; the material may also be tanned or curried.

Comparative Intensity of Electric Light and Gas. — The London *Daily News* says: "Some curious and useful information about the lights displayed from the Clock Tower of the Houses of Parliament is given in a report just made to the House of Commons. It appears that the two semi-lanterns, which a spectator at Westminster sees 250 feet above him in the Clock Tower, are in the hands of two rivals — one of whom employs gas, and the other electricity, as the source of illuminating power. The Wigham light has three burners, each composed of 108 jets, placed one above another on the same axis. The electric light is produced by an electro-magnetic machine, worked by steam power, the currents being conducted from the machine to the lantern along 1700 ft. of copper wires. The report is decidedly favorable to the electro-magnetic process. Thus Mr. Douglas states that the electric light has a superior intensity of 65 per cent. when one 108 jet burner is used, and of 27 per cent. when three are employed. So, again, as to cost, the electric method produces a saving of 162 per cent., when one 108 jet gas burner is used, and of 133 per cent. when three such burners are used."

PRACTICAL RECIPES.

Rosewood Stain. — Take 1 gallon alcohol, 1 lb. red sanders, 1 lb. dragon's-blood, 1 lb. extract logwood, ½ lb. gum shellac. Put the mixture into a jug, steep well till it obtains its full strength. Then strain and it will be ready for use. Apply with a brush, giving one, two, or more coats, according to the depth of color desired. Then give one or more coats of varnish. This stain is suitable for use on cane, willow, or reed work, and produces a good imitation of rosewood.

To Fasten Handles to Knives, etc. — The following mixture is recommended for this purpose in the *Scientific American:* Mix together one pound of rosin and eight ounces of sulphur, and keep it either in bars or reduced to powder; mix one part of this powder with half a part of iron filings, fine sand, or brick-dust, and the cavity of the handle is to be filled with this mixture. Heat the stem of the knife or fork and insert it hot, and when cold it will be found tight.

To Render Carmine more Pure and Brilliant. — Put the carmine in a solution of ammonia, and place in the sunshine. When the ammonia has acquired an intense blood-red color, it is poured off, and alcohol and acetic acid are added to it. The carmine is precipitated in a state of greatly increased brilliancy, the pure carmine being separated from the alumina.

A Reddish-Brown Paint for Wood. — The wood is first washed with a solution of 1 lb. cupric sulphate (blue vitriol) in 1 gallon of water, and then with ½ lb. potassic ferrocyanide (prussiate of potash) dissolved in 1 gallon of water. The resulting brown cupric ferrocyanide withstands the weather, and is not attacked by insects. It may be covered, if desired, with a coat of linseed-oil varnish.

Agriculture.

NOVELTIES IN TREES, VINES, ETC.

The experiences of nearly or quite all cultivators of fruits, vines, etc., in this country, coincide in one particular, and that is, that new varieties are not often so good or desirable as they have been led to expect. Every fruit cultivator or gardener looks back upon more than one instance in which he was made the victim of some pomological quack, who forced upon him his new and wonderful plants at most exorbitant prices. The enterprising gardener is naturally on the lookout for novelties in his line, and there are plenty of equally enterprising advertisers and pedlers who make a business of supplying the new and extraordinary plants. In the way of potato novelties, it is no unusual thing for dealers to sell bushels of innocent but very common tubers at three or five dollars a pound; in vines, a new variety, well advertised, is considered cheap at five dollars a single plant. These are often purposely kept in a state of feebleness, so that if they maintain vitality after passing into the hands of purchasers, it requires five or ten years to bring them into bearing. New strawberries and other fruits are sold at equally exorbitant prices.

Now, if our expectations, based upon the statements of propagators and venders, were fully realized, there would perhaps be no reason to complain; but unfortunately they are not. During the past twelve years we have purchased a large number of the novelties in every branch of horticulture, and in looking over the list of those condemned as worthless, we find it to be much larger than that in which are found the names of those worthy to be retained. After experimenting with thirty or more new varieties of strawberries, the conclusion is reached that the old Hovey Seedling in flavor and general excellence remains without a rival. For the past two years we have cultivated no other variety. The Concord and Delaware grapes must be spoken of in the same way; no new varieties have supplanted them, and probably none ever will. Any variety of grape more delicate or delicious than the Delaware is not adapted to our soil and climate, and cannot flourish. It is the very best fruit of the vine that can be successfully cultivated in any of the Northern States. The Early Rose potato has proved a desirable acquisition; there are but few other new kinds that are worthy of attention. Considerable progress has been made in cultivating improved varieties of pears, but most of those introduced within the past ten years are not as good as we had before.

Undoubtedly there is a limit to excellence, in all kinds of fruits, vegetables, and flowers. This limit is intimately related to climate and soil. If we succeed in producing a new specimen of some variety, of extraordinary delicacy and goodness, it is doubtful if we can secure another, as the plant is usually exceedingly weak and delicate, and like promising children, it does not live to "grow up." It may not be well to discourage effort in the direction of improving our table luxuries, but the prospect is really not a very hopeful one. We have, manifestly, nearly or quite reached the limit which nature permits, and we are led to go back to some of our neglected good things, rather than to seek very earnestly for those which are better.

INCREASING THE MANURIAL RESOURCES OF FARMS.

THERE are no questions oftener asked by farmers, than those which relate to methods by which manurial resources may be increased. Conductors of agricultural journals are pestered with such questions, and make extraordinary efforts to answer them. It must be confessed that in most instances the answers are not very creditable to the journals, or satisfactory to the inquirers. Farmers are usually told that they are allowing some of the most valuable sources of plant nutriment to run to waste, that they should make huge compost heaps, and thus double and quadruple their manures. Yes, but what shall we put into our compost heaps? they ask. Oh, scrape together all the waste products of kitchens cess-pools, wood yards, vaults, etc., and make one grand heap. Now every farmer of ordinary thrift is careful to utilize all the products from these sources, and therefore they ask again, What other products are there of which we can make our compost? This is putting the wise journalists in a tight place, and they usually find rest for a time by directing them to procure "turf from under old walls," or "road dust," or "muck," or "dry leaves from the woods." Intelligent farmers know better than to spend much valuable time in collecting such trash, and so the matter rests.

Now it is true that in order to manufacture valuable plant food, there must be provided the agents indispensable to its production. What folly to advise farmers to pile up a heap of bulky material, in which there is little or none of the elements upon which alone plants are nourished! To feed plants we *must* have one or more of four important agents in the material provided. There must be present either potash, phosphoric acid, lime, or some agent holding nitrogen. If no one of these is present, the material is practically worthless. It is common, too common, to exaggerate the home resources of farmers in the production of true manures. There is but very little value in leaves, "muck," turf, or road dust. Costly as labor is at present, it will not pay to collect these articles, to be used by themselves unmixed with the more costly fertilizers. A compost heap formed of these materials, they being used simply as absorbents to hold liquids, as urine or the waste from sink spouts, is well enough. A heap of this kind is to be commended. The real waste among well-to-do farmers is in the throwing away of house slops, and in allowing the liquid excrement of animals to be lost.

It is better to advise farmers to save every drop of the liquids of the house and barn, than to urge them to pile up huge heaps of inert substances to be used as fertilizers. A heap of dry muck or peat, which in itself has no special value, may be used advantageously to absorb the valuable liquids of the house and barn, and in this way a farmer may largely increase his manurial resources without incurring great expense.

PRESERVING MANURES.

IT often happens that farmers are limited as regards room for the storage of manures under cover, and the question arises, What is the best method of preserving animal excrement in the open field? It should be understood that if we introduce safeguards to prevent loss in two directions, we accomplish all that is necessary. Animal manures may be weakened by loss of volatile ammonia and other gaseous products, and also by leaching, by which the most valuable soluble salts are dissolved by rains and carried away. To prevent the loss of ammonia it is only necessary to cover the heap with good soil or loam to the depth of eight or ten inches. Previous to putting on the soil, a bushel of plaster or gypsum may advantageously be sprinkled over the heap. The whole mass should be perfectly covered, so that no avenues of escape are afforded to the volatile products. In this way, the soil becomes in a few months so saturated with fertilizing material that it is a valuable agent to apply to crops in itself.

To prevent loss by leaching, it is well to throw over an exposed heap of excrement a covering of straw or old hay. If the form is like a stack of hay, nearly all the water will run off the sides, and but little percolate through. It is miserably slack and wasteful to haul out manures into fields in the autumn or winter, and allow them to remain without any protection. During the past two years more excrement has been produced at the farm than we could conveniently use upon our fields, and in removing it from the cellar we have protected it in the manner described. One heap has thus been covered for two years, and its valuable qualities have not only been preserved, but by the processes of spontaneous decomposition the products are now ready for immediate assimilation by plants, and the soil applied is nearly as valuable as the material which it has covered and protected. Three years ago some heaps of manure were carted upon a meadow in winter, and owing to flowage from the lake it was deemed best not to disturb them until the meadow was thoroughly drained. Several of them, spread last season, gave most extraordinary returns in grass, and the two remaining heaps have been opened this season and found in perfect condition.

There is no difficulty in preserving manures out-of-doors, if the measures are adopted which we have here presented.

VEGETABLE FATS.

THE subject of vegetable fats has been one of the most obscure in the whole range of plant chemistry, but the researches of German investigators, of which we find full reports in foreign journals, have lately been the means of clearing it up to a great extent. The matter is one of much practical importance, as fat is the most concentrated of foods. A pound of digestible fat adds more to the weight of the body, or furnishes more muscular work, than the same weight of any other kind of food.

Vegetable fats are found most abundantly in the seeds of plants; the embryo and the external coating of the seed usually containing an extraordinary quantity. Thus maize contains about 5 per cent. of oil; but Haberlandt found that the embryo of the grain when separated contained 30 per cent. of oil, and that practically the whole of the fat occurred in this part of the seed. Wheat contains but 1.5 per cent. of fat, but Church found in the embryo 4.18 per cent. Wheat bran equally illustrates the concentration of fat in the outer layers of the seed, bran containing as much as 4.5 per cent. of fat. The fat in the exterior part of the seed seems intended to afford protection against injury from water. The same thing is observed in the case of potato tubers and beet-root, in both of which, according to König, the fat is chiefly concentrated in the outer skin.

Another part of the plant in which fat is generally abundant is the leaf. The bluish bloom on the leaves of luxuriant cereals consists of waxy matter, which in some cases is present in very considerable quantities. Arendt found in the lower leaves of oats, at the time of blooming, as much as one tenth their dry weight of fat and wax. In fodder crops generally the amount of fat is greatest in young and luxuriant herbage, while in the mature hay crop the proportion of fat is much smaller; the fat is also increased by nitrogenous manuring. Thus Way found in grass from a water-meadow, collected on April 30, as much as 6.5 per cent. of fat, but in grass from the same meadow collected on June 26, he found the fat only 2.1 per cent. of the dry matter. The effect of high manuring in increasing the amount of fat is shown in the analyses of the sewaged and unsewaged grass at Rugby. The unsewaged grass contained 2.87 per cent. of fat; in the sewaged grass the amount found was above 4 per cent.

The nature of the vegetable fats in green fodder has only quite lately been made the subject of experiment. It was well known by chemists that oils and fats consisted, as a rule, of compounds of various fatty acids with glycerine, and it was supposed that, save in the case of wax, spermaceti, and a few distinct bodies, fats were in all cases made up of these glycerides. The German feeding experiments had, however, shown that the fat of hay was not nearly so digestible as the fat of many seeds, only 40 to 50 per cent. of the fat of hay being assimilated by sheep, while 90 per cent. of the linseed oil given was readily digested.

J. König, to whom we owe the recent investigation of this subject, began by showing that the fat of grass and clover hay, and also of rye, oat, and pea straw, could be separated, by treatment with strong alcohol, into a solid waxy substance, and a fat, which in the case of hay was of a fluid character. At first he considered the fluid fat soluble in alcohol to be a true glyceride, and he believed that by treating with alcohol the fat extracted from hay by ether, he should be able to separate the true fat from the wax, and to determine with considerable exactness the amount of digestible fat which a sample of hay contained. E. Schulze has, however, since proved that although the fluid fat of hay contains the same proportion of carbon and hydrogen as ordinary fat, it is yet clearly not an ordinary fat, since no glycerine can be obtained from it; he showed also that the waxy matter of hay cannot be pronounced wholly indigestible, nor the fluid fat entirely digestible. König has still more recently confirmed Schulze's statement as to the absence of glycerine in the fat of hay, and he has further shown that glycerine is absent in the fat of oats, rye, and vetch seed. His investigations have not yet included a wide range of plants, but it seems probable that in many other instances the at or oil is really of a different nature from that hitherto supposed.

In hay and oat straw, and in the grain of oats,

rye, and vetches, König finds oleic and palmitic acid, not combined with glycerine, but in a free state, and it appears that in linseed, also, a part of the oleic is uncombined. As oleic and palmitic acids in their combined forms are well known to be large ingredients of nutritive fats and oils, there can be no doubt that, so far as these acids are concerned, the fat of hay will be both digestible and nutritive.

König has also found in hay and oat straw cholesterine, a substance best known as an ingredient of animal bile, but also previously ascertained as occurring occasionally with vegetable fats. Another substance found is cerotic acid, a solid waxy body, one of the constituents of ordinary beeswax, which contains about 22 per cent. of this substance. There are present, besides, two fatty substances, one fluid and one solid, which appear to be definite bodies, having the characters of fatty alcohols; these are new to science. But the most interesting discovery of all is the presence in hay fat of a hydrocarbon. The relations of this body are as yet not fully made out, but it agrees in several respects with some of the paraffins.

The examination of hay fat has thus yielded a rich harvest of results, and the way is opened for more extended researches. The scientific interest of the research is very great, and, as we have intimated, the investigation has also its practical importance, for when we really know the nature of the fat occurring in different plants we shall be far better able to judge of its nutritive value.

BREVITIES.

An Agricultural Paradise. — A Western paper thus sketches the rural delights of a farmer's life in that region: "At daylight he investigates his corn-hills for cut-worms. Then he gets up an appetite for his breakfast by crushing codling-moth larvæ with a hoe-handle. During the forenoon he indulges the potato-bugs with a solution of Paris green. His post-prandial pleasure is to scald the chinch-bugs. His evening delight is to smudge peach-trees to keep down the curculio. When he wakes to another day of toil, he hears fresh grasshoppers tinkling against the pane."

A California Orchard. — A Mr. Briggs, of Yuba City, California, has a solid block of fruit-trees covering 210 acres. The soil is a light sandy loam, and is constantly cultivated with ploughs through the whole season. It contains 8000 peach-trees of sixteen varieties (4000 being of one variety, the Red May); 3000 apricot-trees of twelve varieties; 4000 cherry-trees of twelve varieties; 7000 plum-trees of fifteen sorts; 2000 apple-trees of only eight varieties; 1000 pear-trees, mostly Bartletts; 1500 "Cherry Plum" (P. myrobolana) trees and 150 June (Jaune Hative) Plum trees. There are also 1500 walnut-trees (Juglans regia), of three sorts. The cost of the land was about 17,000 dollars; total cost for orchards, land and all, is less than 30,000 dollars, and the estimated value is 50,000 dollars.

Fuchsia Seed. — A person visiting a fuchsia-house, on one of the Continental seed farms, was asked to guess the weight of seed procured from the house — about 10 by 30 feet in size. Twenty, ten, and even as little as one pound were suggested, but the fact proved that the entire product was only one quarter of an ounce. *The Garden* says that Mr. Cannell's specimen fuchsia-house, 30 feet by 20 feet, has not yet afforded him a quarter of an ounce in one season. One may infer from these facts how fine the seed is.

Boston Journal of Chemistry.

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PUBLISHERS' NOTICE.

The office of the Journal of Chemistry has been removed to the new building, 125 *Milk Street, Boston*, and that will hereafter be the address of the publishers, Messrs. Billings, Clapp, & Co.

Since the great fire of November, 1872, by which the Journal was driven from the dwelling it had occupied from its birth in July, 1866, it has found a temporary resting-place in Oliver Street, where it has been confined to somewhat narrow and inconvenient quarters; but it now removes to a new and, we trust, a permanent home in the very heart of the "new Boston" that has risen from the ruins of the old. Here it has plenty of room, with every facility for the transaction of its steadily increasing business, and an attractive office to which it need not be ashamed to welcome its patrons and friends. The location is literally a central one, fronting on the enlarged Liberty Square, in full view of State Street, and a moment's walk from the new post-office. The office occupies the entire front of the second story, and has been fitted and furnished expressly for the purpose.

The remainder of this floor of the building, with the whole of the two floors above, is occupied by Messrs. Billings, Clapp, & Co. as their city warehouse and salesrooms. The development and growth of their business has for some time demanded ampler accommodations for the mercantile department, corresponding to those furnished by their new chemical laboratory at Newton (described in the Journal for October, 1873) for the manufacturing department, and this want is now happily supplied.

CHEMISTRY AND OPTICS.

It would at first view seem quite impossible that chemistry could receive much aid from optics, so wide apart apparently are the two branches of science. But it is true that some of the grandest discoveries in modern chemistry have been made through the assistance of optical instruments. The spectroscope has enabled chemistry to overleap a barrier which the great philosopher Comte pronounced to be insurmountable, and which would have excluded from the objects of chemical research anything lying without the boundaries of our earth. Comte asserted that we could never know anything of the planetary worlds except what related to their geometrical and mechanical properties — the nature of their movements, and the forces by which they are produced. This limitation effectually shut out chemistry, and compelled the chemist to confine his labors to our little earth alone. Had Comte lived in this age, the falsity of his views would have astonished him. The chemist now devotes much attention to the study of elements existing in the orbs millions of miles distant, and the certainty with which he detects in the sun and stars mineral matter identical with that found here is indeed wonderful.

Optics can assist the chemist in other ways. Within a few years polariscopic instruments have been used as an important aid in chemical research, and it is probable that the polarized ray will be found still more useful as progress is made in the science. No advantage has thus far been gained in the use of the polariscope, outside of the organic world, but we cannot believe that its use is thus limited. A ray of polarized light when transmitted through certain organic liquids undergoes a change, and the plane of polarization is reversed. This is specially the case when some solutions of quinia are acted upon, and from this action a view is obtained of the chemical nature of the solutions. Some organic bodies are strongly influenced by light, and perfect decomposition results from its agency. It is possible that in the future of chemistry, a large number of reactions now imperfectly understood will be elucidated by a better knowledge of the nature and influence of light. It is well understood that lesions of the human body, or diseases, are a kind of chemical changes over which light exercises most potent control. If through the study of optics and the use of optical instruments, new views of the nature of disease are obtained, not only the chemist but the physician will secure new and important triumphs.

THE BRITISH ASSOCIATION.

This association of learned gentlemen has secured through the addresses of Professors Tyndall and Huxley an unusual amount of notoriety on this side of the Atlantic as well as on the other. The meeting held at Belfast, in August, was largely attended. The number present on the first day exceeded fourteen hundred, and probably twice that number congregated before the close of the sessions. The Belfast people, having an eye to business, put up prices, so that some of the *savants* had to pay as much as twenty shillings, or five dollars, for a night's lodging. Before the meeting, they professed to be very generously inclined, and promised a large hospitality; but their *professions* culminated in emptying the pockets of the *professors*. Five dollars for a bed for a single night does n't frighten us "North Americans" (as some of the scientists designate us), for we are used to such charges; but the enormity causes John Bull to growl loud enough almost to shake his little islands.

The British Association corresponds in most particulars with our American Association. The meetings are open, democratic, and a pretty wide latitude is permitted in the discussion of topics. Papers are read which would hardly be listened to in the more exclusive gatherings of scientific investigators at other times or places. A few able men, however, are careful to keep their hands on the helm, and so guide affairs as to prevent any positive discredit from attaching to the proceedings.

Such gatherings both here and there are salutary in their influence, as they bring together, along with the multitude of shallow men, a large number of profound thinkers and investigators; and they tend to soften or eradicate the conceits, prejudices, and hatreds which exist among scientific men as well as among all other classes. They are also promotive of industry in research, and serve to excite ambition among the younger members, who are likely to obtain a hearing, if in any fair measure found worthy. The presiding

officer is changed each year, and upon assuming the chair is expected to give an address in which he is at liberty to say anything he chooses. Professor Tyndall has succeeded in making a noise by his address, the reverberations of which will not probably die out during the year.

THE ORIGIN OF WEATHER TELEGRAPHY.

The nationality of "Old Probabilities" has been a matter of discussion, but there can be no reasonable doubt that he is a genuine Yankee. Some have tried to make him out a Frenchman, about twenty years of age. Leverrier, in 1854, called attention to the importance of systematic weather reports, and in 1855, Louis Napoleon authorized such an undertaking. The stations from which the reports were received were mostly in France; but in 1857, the network was extended to foreign countries. In 1858, all the important cities of Europe were included, and on the 1st of January of that year began the publication of the *Bulletin International.* Up to 1863 occasional weather warnings were issued by the French astronomer, but it was only in that year that the French system of daily probabilities of weather was inaugurated. In 1865, commenced the series of quarterly volumes of the *Atlas Général des Mouvements de l'Atmosphere.* Since that time the progress of weather telegraphy in Europe has been very rapid.

But the proposal to use the telegraph for this purpose was made in this country at least eight years earlier than Leverrier made the suggestion in France. Professor Abbé, in *Silliman's Journal,* traces the first printed hint of the kind to Professor Redfield, who in 1846 wrote to that journal as follows: "In the Atlantic ports, the approach of a gale may be made known by means of the electric telegraph, which probably will soon extend from Maine to the Mississippi." The next mention of the subject is found in the *Smithsonian Report* for 1847, in an article by Professor Loomis: "When the magnetic telegraph is extended from New York to New Orleans and St. Louis, it may be made subservient to the protection of our commerce, even in the present imperfect state of our knowledge of storms." But however frequently the suggestion may have been made, it is to Professor Henry and his assistants in the Smithsonian Institution that we must assign the credit of having first acted upon it; and the agitation of this subject in the United States probably stimulated the subsequent action of European meteorologists.

References to the subject may be found in the *Smithsonian Reports* for 1848, 1849, 1850, and 1851. In that for 1849, it is stated that "successful applications have been made to the presidents of a number of telegraph lines to allow, at a certain period of the day, the use of their wires for the transmission of meteorological intelligence;" and in that for 1851 we are informed that "since the date of the last report, the system particularly intended to investigate the nature of American storms, immediately under the care of the Institution, has been continued and improved." The system of weather reports thus inaugurated remained in regular operation till 1861, when the disturbed condition of the country rendered its continuance impossible. But even before peace had been proclaimed, Professor Henry sought to revive the systematic daily weather reports; and in August, 1863, at the meeting of the North American Telegraph Association, a paper was presented by Professor Baird, on behalf of the Smithsonian Institution, requesting the privilege of the use of the telegraph lines, and more especially in order to enable Professor Henry "to resume and extend the *Weather Bulletin,* and to give warning of important atmospheric changes to our seaboard." The Telegraph Association in response offered the free use of their wires for the desired purpose, and the inauguration of the enterprise was fixed for 1865; but the fire in January of that year, which so seriously embarrassed the labors of the Smithsonian Institution, compelled a postponement of the work to a more favorable time.

Professor Abbé sums up the matter as follows: —

"It will thus be seen, that without material aid from the government, but through the enlightened policy of the telegraph companies, and with the assistance of the munificent bequest of James Smithson 'for the increase and diffusion of knowledge,' the Smithsonian Institution, first in the world, organized a comprehensive system of telegraphic meteorology, and has thus given, first to Europe and Asia, and now to the United States, that most beneficent national application of modern science, the Storm Warnings."

COTTON.

With the change of condition at the South, much more attention is being paid to the proper cultivation of the soil; and since it no longer pays to abandon old farms and take new ones, there seems to be considerable activity manifested in ascertaining what is necessary to return to the soil after taking off a crop of cotton.

We have received two recent essays in this direction. The first is by Wm. J. Land, chemist, of Atlanta, Ga., in which he gives the analyses of cotton seed and cotton lint as follows: —

	Cotton Lint.	Cotton Seed.
Potash	50.371	36.712
Soda	2.672	0.839
Magnesia	11.191	15.600
Lime	7.912	4.609
Phosphoric acid	4.285	31.093
Sulphuric acid	4.112	3.337
Oxide of iron and alumina	1.508	1.113
Oxide of manganese	.714	
Chlorine	2.123	0.507
Sand and charcoal	15.112	6.190
	100.	100.

The ash of the lint is .855 per cent. of its weight, and the ash of the seed 3.59 per cent.

The second report is an account of a series of experiments with different fertilizers upon the cotton plant, by E. M. Pendleton of the Georgia State College. We can only give a few of his conclusions: —

That no compound which does not contain soluble phosphoric acid will pay upon the worn-out soils.

That 200 lbs. of a good ammoniated superphosphate is about the quantity to be used on an acre of cotton.

That with good cultivation, good fertilizers will pay even at the lowest rates for cotton; but with bad cultivation they will hardly pay at any price.

That cotton seed makes a good fertilizer when used in connection with good superphosphate.

In this report analyses of quite a number of commercial fertilizers are also given.

Another prehistoric human skeleton has been recently discovered at Mentone.

EDITORIAL NOTES.

A Grand Aquarium in London. — A company under the title of the Royal Aquarium and Summer and Winter Garden Society has been started, the object of which is to provide London with an aquarium and winter garden, and in connection therewith to afford facilities generally for the promotion of artistic, scientific, and musical entertainments. A site has been procured facing the Houses of Parliament and Westminster Abbey, and lying between the new Government offices and Victoria Street. The centre or main transepts of the building will be constructed principally of glass, forming a large conservatory and promenade surrounded by galleries. The aquarium will be a special feature, being the first of its kind established in London; and no pains will be spared to render it at once the most complete and instructive aquarium in the world; the experience already gained in the construction and management of the Brighton, Crystal Palace, and Manchester aquaria will be fully utilized, and prove highly advantageous in the completion of the present enterprise. It may be specially noted that the marine aquarium has of late years proved one of the most attractive places of resort for all classes of society. In connection with the main building there will be rooms for private concerts and for the delivery of popular lectures on matters pertaining to science and art, and other subjects of public interest.

Straw Lightning Conductors. — Straw is about the last material one would think of using for a "lightning rod," but according to a French journal it answers the purpose admirably. It had been observed that straw had the property of discharging Leyden jars without spark or explosion, and some one in the neighborhood of Tarbes got the idea of constructing lightning conductors, which were formed by fastening a wisp or rope of straw to a deal stick by means of brass wire, and capping the conductor with a copper point. It is asserted that the experiment has been tried on a large scale around Tarbes, eighteen communes having been provided with such straw conductors, only one being erected for every 60 arpents, or 750 acres, and that the whole neighborhood has thus been preserved from the effects, not only of lightning, but of hail also. *The Journal of the Society of Arts* says: "This statement comes from a respectable source, and the apparatus being extremely simple and inexpensive, it is at any rate worth a trial. Copper conductors are out of the question in ninety-nine cases out of a hundred, but every cottager almost could set up a straw one."

Mechanics of Ancient Warfare. — An interesting experiment says *Nature,* was recently made by MM. Bertrand and Mortillet, directors of the St. Germain Museum. The war implements constructed from designs of Trajan's Column were tested, when it was found that the catapult threw arrows a distance of 300 yards. The mark was hit regularly each time up to 180 yards. The same can be said of the *onager,* which sent stones to a distance of 180 yards with astonishing precision, although weighing $1\frac{1}{2}$ lbs. The initial velocity was calculated to be more than 50 metres per second, as the time taken to reach the mark is not more than seven seconds, and sometimes less than five. All these forms of apparatus are to be tried at a public exhibition to be given in October.

The California Wheat Crop. — The wheat crop of California for the present year is estimated at fully *forty millions of bushels.* This is about one sixth of the whole production of the United States last year. This vast quantity of grain, too, is the product of little more than one tenth of the area of the whole State. What will be the value of the wheat harvest when the whole of the available lands shall be brought under cultivation, can hardly be

estimated. "The Golden Gate" will truly be the portal of the world's granary, as it has been the outlet of a stream of gold. It is estimated that 600 ships of 1500 tons each would be required to transport the crop to market. The freight to Europe would amount to $20,000,000 in gold, and each ship would earn over $30,000 as its share of the freight. Here is comfort, certainly, both to the Californians and to the hungry Europeans.

Consumption of Tobacco, Beer, and Tea. — A writer in the *Deutsche Industrie Zeitung* gives a number of calculations relative to the production and consumption of various articles of commerce, including tobacco, beer, and tea. The production of tobacco reaches at the least 12,000,000 cwt. yearly, of which 2,000,000 is from North America, 1,000,000 from Austria, and 560,000 cwt. from Germany. The value of this production is about 160,000,000 florins (the florin is about 40 cents), and the consumption per head of the population yearly is, in North America 3 lbs., in Cuba 2.3, in Austria 2.8, in Germany 3.1, in Holland 4.7, in Italy 1.5, in Russia 1. The beer production in Europe and North America last year was all together about 11,500,000,000 litres (there are about 4½ litres to one gallon), and the annual consumption per head is, in Bavaria 219 litres, in Würtemburg 154, in Belgium 145, in England 118, in Saxony 60, in Austria 34½, in Russia 14, in North America 26. The tea production is estimated at 2,800,000 cwt., of which 2,000,000 cwt. is from Eastern Asia alone. The consumption of tea in Europe is about 1,600,000 cwt., in North America about 400,000 cwt.; and it is calculated that there is annually consumed, per head, in England 3.3 lbs., in North America 1, in Russia 0.15, in the Zollverein 0.04, in France 0.02, in Austria, 0.1.

Cruelty to Horses. — The *Pall Mall Gazette* says: "It is to be regretted that no animal save man was able to take part in the meetings lately held in London by the International Congress for the Prevention of Cruelty to Animals, for there can be little doubt that an intelligent animal gifted with speech would have pointed out many acts of cruelty committed on dumb creatures which are entirely overlooked by those who confine their observation to active acts of cruelty, and forget that some of the greatest sufferings endured by both man and beast arise from sins of omission rather than of commission. For instance, it is cruel to beat a horse with unnecessary violence, but it is even more cruel to keep the horse in the stable without sufficient air or exercise, and with food either more than enough or less than enough to preserve the beast in good health. If the members of the Congress had inspected the stables in the mews hidden behind the big houses of London, they would have found horses of every description shut up in ill-ventilated, over-crowded prisons, uncheered by one ray of sunshine, and either over-fed or half-starved, according to the rascality or ignorance of the coachman and his fellow-stableman. Death to many of these horses would be a positive boon compared with the unhealthy monotonous existence they lead."

A Chemist's Misadventure. — The London *Chemist and Druggist* says that a valuable work has been lost to the world by an extraordinary accident. Professor Bunsen, of Heidelberg, the famous chemist, has been engaged for four years preparing a new work, which was shortly to have been published, and its appearance was looked forward to with great interest by the scientific world. The Professor, not long ago, in starting for a short walk, left the manuscript of his new book, both the rough copy and notes and the copy for the printer, lying on his desk. On his return he found both sets of papers, with some others, in flames, and before he could put out the fire they were burnt to ashes. Not a leaf has been left. It appears that some lucifer matches lying about the desk were ignited by the sun and set fire to the valuable manuscripts.

A Good Market for Old Hats. — It is said that the inhabitants of the Nicobar Islands, a group in the Indian Ocean, about one hundred and fifty miles south of the better known Andamans, have a universal passion for the cast-off hats of civilization. There is a regular trade in old hats between Calcutta and the Nicobars. The value of the article is measured in cocoa-nuts, the only produce of the islands. The chimney-pot is the favorite shape, the taller the better; and the consummation of Nicobarian desire is the possession of a high white hat, with a black band round it. Such a hat is worth, we are told, from fifty to sixty-five cocoa-nuts, and is the favorite attire of the noble savage when he goes a-fishing, clad for the rest only in the usual waist cloth.

Value of Land in London. — The site of the church of St. Martin Outwich, at the corner of Threadneedle and Bishopgate streets, having a superficial area of 2210 feet, has been disposed of for the sum of £32,050, or at the rate of £14 10*s.* (about $72) per square foot, more than £600,000 per acre.

ATOMS.

During the first three months of 1874, 2111 horses, asses, and mules were killed for food in Paris; the numbers for the corresponding period of 1872 and 1870 being, respectively, 1275 and 989. — Probably the longest rope in the world is one lately made in England, which measures 10,000 fathoms without a splice; it is of three strands and two inches in diameter. — It is said that the oxyuris vermicularis, or thread-worm, may be readily dislodged from its favorite habitat in the rectum by the injection of from two to three ounces of ol. morrhuæ, repeated once or twice. — There is a woman in Oshkosh, 104 years old, but the record adds that "she never used kerosene." — A Cincinnati paper is anxious to know what the brewers of that city do with the tobacco-stems they purchase in such large quantities. — The deepest coal shaft in England, and probably in the world, is the Dunkenfield, 2060 feet, and reaches a seam of coal only 4 feet 8½ inches thick. — According to the latest reports, the diamond fields of South Africa are giving out, the production of the principal bed having fallen off 50 per cent. from the yield of the last two years, and 30 per cent. from that of the last year. — The coal area of Arkansas is 12,000 square miles. — The legislature of Pennsylvania has passed a bill for a new geological survey of the State. — Within the past five years 28,396 miles of railway have been constructed in this country. — The *Fédération Artistique* states that a Venetian founder has devised a new process of casting, by which, with a single flow of the molten metal, not only large statues but the most complicated groups can be produced at once and with the most perfect finish. — It is said that the dyestuff known as saffranine, if mixed with strong sulphuric acid, develops a fine blue tint, which becomes emerald green by addition of a little water. — According to an English photographer common white cotton cloth becomes water-proof by being dipped for an instant in dilute sulphuric acid. — The Yankee form of street watering-cart has been introduced into London under the sonorous appellation of "hydrostatic van." English names, however, are sometimes simpler than those in vogue in this country, as, for instance, "lift" instead of "elevator." — That there is always a right and a wrong way of doing things cannot be better exemplified than in the familiar instance of a ball of string, which, if opened from the *inside*, will run off easily enough, and give no trouble in the untwining, but if begun from the *outside*, will speedily get tangled and into confusion. — At the recent medical congress held at Marseilles, the majority of the doctors present agreed that the best possible diet for children was oatmeal porridge and sweet milk. — Anhydrous stearate of alumina, dissolved in turpentine, is recommended as a limpid and flexible varnish unalterable at all temperatures. — A solution of pearlash (carbonate of potash) in water, thrown upon a fire, extinguishes it instantly; the proportion is four ounces, dissolved in hot water, and then poured into a bucket of common water. — A party of the members of the International Sanitary Congress in Vienna had the honor of dining with the Emperor of Austria at Schönbrunn. — Over 200,000 tons of sulphuric acid are annually made in England. — A good cement for attaching paper labels to metal surfaces is composed of ten parts tragacanth mucilage, ten parts honey, and one part flour. — Olive oil, if administered promptly, is said to be an antidote for strychnia. — A canny Scot has discovered that if a hide is immersed for four or five days in a mixture of vegetable or animal charcoal and water, of the consistency of a thin paste, the hair is entirely removed, and the leather made from a hide thus treated is of superior quality. — A pinch of powdered sal-ammoniac in the water in which cut flowers are put will keep them fresh a long time. — The English official estimate of the comparative value of scientific research and rhetorical twaddle is shown by the fact that while the widow of the Arctic explorer M'Clure gets a pension of £50 in recognition of her husband's services, and the four children of Dr. Livingstone each the same amount, Mr. Tupper is awarded £150 a year as author of "Proverbial Philosophy"! — A writer in the *English Mechanic*, who has been very successful in preserving flowers in their natural colors, does it in this way: "Several sheets of thick bibulous paper are soaked in a solution of chloride of calcium; the plants are put between two sheets of ordinary paper, and a sheet of the prepared paper (previously dried nearly to baking, in an oven) laid over them; the whole is then placed, as usual, in the press, and the chloridized sheets redried and exchanged when necessary." — A gentleman of Milan, named Ponti, has left his property, amounting to 825,000 francs ($165,000) to the three Academies of Science in London, Vienna, and Paris, and to the General Hospital in Vienna, the last-named institution being also entitled to any increase beyond the original sum; and the value of the property being now estimated at $360,000, the hospital is likely to receive a large share. — T. B. Aldrich, in his pleasant sketch of Portsmouth, N. H., in *Harper's Monthly* for October, says that the lightning-rod which protects the Warner House to-day was put up under the personal supervision of Benjamin Franklin in 1762, and is supposed to be the first rod put up in New Hampshire. — Sir James Paget says the best wash for hardening the skin, to prevent bedsores, is one part of sweet spirits of nitre to three parts of water.

FACETIÆ.

Popular Medical Nomenclature. — The London *Globe* says: "The Medical Officer to the General Post-Office, in his report on the candidates for minor appointments in that department during the past year, gives a few examples of the replies of candidates in making their written statements as to the medical histories of their families, or of themselves, and he remarks, 'It is to be hoped that in future years the effects of compulsory education may be shown by rendering such replies among the things of the past:' 'Father had a sunstroke and I caught it of him;' 'My little brother died of some funny name;' 'A great white cat drawed my sister's breath, and she died of it;' 'Apperplexity;' 'Parasles;' 'I caught tiber fever in the Hackney-road;' 'I had gearnders;' 'Burralger in the

head;' 'Rummitanic pains;' 'Shortness of breadth;' 'Carracatic fever;' 'Indigestion of the lungs;' 'Sister was consumpted, now she's quite well again;' 'Sister died of compulsion;' 'Toncertina in the throat;' 'Pistoles on the back.'"

A Scientific Practical Joke. — In a little work entitled "Recuerdos de Humboldt" (Recollections of Humboldt), the author, Dr. Aristides Rogas, relates what he terms *un incidente gracioso*, which happened to Humboldt at Calabozo. On approaching the llanos he was very anxious to obtain information about the electrical eels (*tembladores*) which abound in the rivers of the district. For this purpose he arranged to visit an eccentric student of electrical science, who before the appointed time contrived with some ingenuity and great difficulty to place one of the animals in question *en rapport* with the knocker on his study door. The servant, as desired by his master, directed the illustrious visitor to rap, and on his doing so a discharge of electricity took place, throwing him to the ground. The narrator goes on to state that Humboldt received his practical information as to the nature and amount of the electricity generated by the *tembladores* with all the equanimity of a philosopher in search of knowledge.

LITERARY NOTES.

Messrs. Lindsay and Blakiston have just added two compact manuals to their long list of standard medical works: *The Complete Handbook of Obstetric Surgery*, by Charles Clay, M. D., of Manchester, Eng. ($2.25); and *A Manual of Surgical Emergencies*, by Wm. Paul Swain, F. R. C. S., Surgeon to the Royal Albert Hospital, Devonport ($2.00). The former is a reprint of the *third* London edition, which has been revised and enlarged, and furnished with additional illustrations. In the latter, the author has fully succeeded in his endeavor to prepare "a small book containing directions for the immediate treatment of all those various emergencies with which the general practitioner may be called upon to deal at any moment." These directions he has given very concisely, and yet with sufficient precision and clearness in details. Both these books may be found at Williams & Co.'s.

A new work in "Putnam's Advanced Science Series" is *Greenwood's Manual of Metallurgy*, vol. i., which is endorsed by "Iron," the leading English authority in that department, as "careful and accurate in its statement of facts, clear in its descriptions, and invaluable as a sound foundation for the study of metallurgy." The second and concluding volume will soon appear. To the "Elementary Science Series" has been added *Macginley's Introduction to Biology*, intended for the use of schools and science classes, but equally adapted to the wants of the general reader, who will find it a good stepping-stone to more advanced works on the subject.

J. R. Osgood & Co. publish *Homes and How to Make Them*, by E. C. Gardner, illustrated by the author — an uncommonly bright and sensible book on house-building, to be specially commended to those who want to know how to make a dwelling comfortable, convenient, and attractive, without making it costly. They have also issued, as a new volume of the "Saunterer's Series," H. H. Boyesen's *Gunnar*, a Norse romance, full of graphic descriptions of Scandinavian scenery, and charming pictures of the social and domestic life of that Northern land. Under the title of "Little Classics," the same publishers have begun a series of handy volumes, small enough for the pocket, but not too fine of type, to be made up of the choicest tales, sketches, and select poems in English literature. The initial number is entitled *Exile*, and contains six stories, including Hawthorne's "Ethan Brand," Hale's "Man without a Country," and De Quincey's "Flight of a Tartar Tribe." Noyes, Holmes, & Co. have all these new books.

The *Report of the Geological Survey of Indiana*, by E. T. Cox, State Geologist, has been printed in a handsome octavo, and is an elaborate and exhaustive account of the work accomplished by the author in discharge of the duty assigned him by the legislature.

The September number of the *International Review* contains an admirable article by Professor C. A. Young, on "The Constitution of the Sun," with other interesting scientific, historical, and literary papers. It will be remembered that this excellent quarterly is on our "Clubbing List."

The Sanitary Record is a new London journal devoted to the discussion of all questions pertaining to public health. It is issued weekly in the same form and style as the "London Medical Record," and by an arrangement with the publishers we are enabled to furnish it *with the* Journal at the low rate of $6 00 per year.

The Spiritual Scientist is "a weekly journal, devoted to the science, history, philosophy, and teachings of spiritualism," just started in this city by Mr. E. Gerry Brown, formerly connected with the "Journal of Commerce." The subscription price is $2 50 per annum.

Medicine and Pharmacy.

SOME FACTS ABOUT REFRIGERATING MIXTURES.

It is well known that extreme degrees of cold, lower than the lowest that have been observed in polar latitudes, are obtained by means of refrigerating mixtures. All these mixtures depend for their action on the familiar fact that heat disappears when a body passes from the solid to the liquid or from the liquid to the gaseous state. When powdered ice and salt are mixed, the melting of the ice is promoted by the affinity of the salt for water, and the large amount of heat absorbed or rendered latent in the process is withdrawn from the nearest bodies, rapidly reducing their temperature.

A much greater degree of cold can be produced by the rapid evaporation of a liquid than by melting a solid. Liquefied carbonic acid, for example, evaporates so fast that a portion of it is frozen solid. The melting point of this solid is —85° F., and its own evaporation keeps it at about —125° F. It is soluble in ether, and the solution evaporates yet more rapidly, producing a temperature of —150° F., or, when the process is conducted in an exhausted receiver, of —166° F. By the evaporation *in vacuo* of a mixture of liquid nitrous oxide and carbonic disulphide, the temperature has been carried down to —220° F., the lowest yet obtained.

M. Bertholet, of the French Academy of Sciences, has been lately experimenting with a mixture of ice and hydrated sulphuric acid, which appears to have remarkable frigorific capabilities. By means of it he has obtained a reduction of temperature which he estimates at 125.6° F., and he has hopes of doing considerably better than this, possibly reaching a "lower deep" of cold than has ever been attained. One account of his researches which we have seen says that he does not despair of getting down to the "absolute zero," which calculation puts at —459° F.

Most substances when reduced to these extremely low temperatures act very energetically upon the human body. Solidified carbonic acid (the temperature of which, as we have stated, may be as low as —125° F.) produces serious burns when compressed between the fingers, injuring the skin in a manner similar to a red-hot iron. It has, however, been recently shown that this frigorific effect varies strangely with the nature of the cold object which is brought in contact with the skin or mucous membrane. Melsens, a well-known Belgian chemist, has recently called the attention of the Academy of Sciences of Belgium to the fact that brandy, frozen to a temperature of from —22° to —31° F., by means of a mixture of ice and chloride of calcium, can be eaten with impunity, and possesses a flavor superior to that of the liquor in its ordinary state. Any alcoholic beverage may be reduced to this low temperature without its hurting the tongue. A wooden spoon must be used in administering it, as a metal one burns the mouth very quickly. The investigator says that not until the liquor is cooled to —76° F. is any sensation of cold experienced; and it has been eaten at —95°, causing no more uneasiness than a mouthful of rather hot soup.

The only explanation of these facts which seems plausible is that the alcohols, when thus rendered extremely cold, remain enveloped in a certain quantity of vapor which hinders their contact with the organs, just as a layer of steam prevents the contact of a drop of water with a heated plate. Further investigations will doubtless throw more light on the curious phenomena.

CINCHO-QUININE.

The following communication from A. B. Briggs, M. D., of Westerly, R. I., appears in the *Philadelphia Medical and Surgical Reporter*, of August 29, 1874:—

The use of cincho-quinine as a substitute for the sulphate of quinia was first brought to my notice in August, 1872. Since that time I have used it with seemingly good results, and as its use at the present time is a subject of comment among numerous physicians, I herewith add my own experience with the comparatively new drug.

As a remedy which possesses the power of arresting morbid periodical movements, its use, in my hands, has been decidedly flattering. Although my experience with it in intermittent fever has, of necessity (on account of locality), been very limited, yet I have used it in several cases, and in every one the results have been good, and in no case has the patient complained of any disagreeable sensation in the head from its use. In several cases of facial neuralgia, the pain occurring in paroxysms, it has been given with decided good results. In one case, the patient a female, the sulphate of quinia was given first, but had to be abandoned on account of the great amount of nausea and vomiting produced. She was put upon the cincho, same dose, and the above unpleasant symptoms vanished. The following case is given as illustrative of its use in simple remittent fever: —

Was called, May 7th, at 10 A. M., to see a patient, C., æt. 34. Found him in bed, suffering from a severe chill; pulse 110; intense cephalalgia, thirst, bowels constipated, slight nausea and epigastric uneasiness, pain in back, respiration hurried, although free, tongue furred, no appetite, face flushed, urinary secretion scanty and quite high-colored. The patient's history was thus: Had not felt as well as usual for the past week or ten days. On the day previous (May 6th) had experienced a chill, which was followed by increased heat of body, and moisture, also by a severe and throbbing headache.

Was ordered comp. cath. pil. iij., to be taken at once. Also the following mixture: —

Tr. aconit. rad.	℥lx.
Potas. nitrat.	ʒiij.
Aquæ puræ	fl. ʒij. M.

Sig. ʒj. every four hours.

Also,

Cincho-quinine	ʒj.

Ft. chart. x. Sig. One powder every four hours, to alternate with above mixture.

May 8th, 3 o'clock P. M. Patient feels about the same as yesterday. Had a chill about 10 o'clock A. M., although not as severe as yesterday's. Pulse 98; headache continues; bowels have moved once, stool very dark; nausea continues; has vomited once or twice. Ordered Seidlitz powder; yesterday's treatment to be continued. Also, powder, cincho-quinine, gr. x., to be taken at 6 o'clock A. M., next day.

May 9th, 5 o'clock P. M. Patient feels much better; has had no chill; pulse 88: bowels moved several times; little or no pain in head or back. Ordered powders, cincho-quinine, grs. ij., every four hours.

May 10th, 5 o'clock P. M. Patient feels very much better. Pulse 70; no chill; bowels open; no nausea; tongue clean; appetite not very good. Ordered the following: —

Cincho-quinine	3ss.
Tr. gent. co.	
Syrupi simplicis	āā fl. ʒij. M.

Sig. ʒj. in water, three times a day, before eating.

Visits discontinued.

The above case is one of quite a number treated with the cincho during the past two years, with the same good results. As a tonic, could I have but one preparation, I should prefer the cincho in place of the sulphate. In more than one case have we seen the sulphate disappoint, when a good result followed upon the use of the cincho; although the alkaloids may possess the anti-intermittent power of the bark, it has certainly not been proven that they exert all the peculiar influence of that medicine as a tonic; in fact, clinical experience has proven the opposite. Now, if any one of the salts of cinchona does not possess that property, and they all combined do, it is plain that a drug containing them all, or nearly all, must have a wider scope for action than those containing but a single salt. Such a drug we believe the cincho to be, and shall be disappointed if it does not so prove itself in the hands of our professional brethren.

It is with pleasure that I recall its use in typhoid fever. Of thirty-two cases of the above fever that have come under my observation during the past two years, in which use had been made of the cincho, but two proved fatal. The treatment was based upon the supposition that typhoid fever was due to a blood poison, which poison exhausts itself in a few weeks at the furthest, if life can be prolonged until that time, and that we have not, or at least do not know, at the present time, of a specific. The treatment consisted, in every case, of nourishment, alcoholic stimulus, and tonics. In the thirty-two cases, the cincho was the only tonic used, with but one exception. In typhoid, one of the greatest dangers is from the severity of the fever. In all fevers of long duration the protracted increased transformation of tissue, on which the feverish overheating depends, induces consumption of the body of the patient. For moderating this fever, the cincho has appeared to be a most efficient remedy. Do not understand me to say that it possesses any abortive properties; the only effect it has upon the disease is to moderate the fever. I usually prescribe one or two grains at a dose, in solution with dilute sulphuric or nitro-hydrochloric acid.

In the case of children, who often show a marked repugnance for the sulphate, the cincho is taken readily, and is seldom if ever followed by any marked gastric disturbance.

A very elegant way in which it may be exhibited to children is in connection with the "Simple Elixir," a formula for which is found in the *Medical and Surgical Reporter*, May 23d, page 483.

A CANINE SURGEON.

The *Wilmington* (*Del.*) *Commercial* tells the following story: —

"A most remarkable instance of sagacity and animal reasoning took place yesterday afternoon at the residence of Whitfield Crawford, southeast corner of Seventh and Madison streets, in this city. The principal actors in the case were a large dog belonging to Mr. Crawford, of the St. Bernard and Newfoundland breed, about two years old, who readily answers to the name of Carlo, and an ordinary domestic house-cat named Dick. Between the two a strong feeling of friendship has always existed, each sharing the other's meals, and at night Dick, appreciating a soft bed, always found it by lying upon his good-natured friend Carlo.

"On Wednesday last, on Mr. Crawford's return from market, he cut a piece of fresh meat into small pieces for Dick, but accidentally a needle and thread lying close by got mixed up with the meat. This poor Dick swallowed, or attempted to swallow, with the meat, but, not succeeding, the needle stuck in his throat, from which cause he of course suffered intensely, and in his sufferings he had the entire sympathies of his friend Carlo. Like a skilful physician, Carlo set about discovering the seat of the disease, which he found existed in Dick's neck.

"After an apparent consultation between the two, one as patient, the other as doctor, Carlo commenced operations by licking Dick's neck, the cat holding its head to one side to give Carlo a fair chance. The licking operation continued all day on Thursday, and at intervals through the night, Carlo occasionally pausing to press his tongue against the neck of his feline friend, as if trying to force some sharp pointed instrument on the inside through the cat's neck to the outside. Yesterday, the same operation was continued by Carlo, until about four o'clock, when he was seen, with his whole body quivering with excitement, trying to catch something with his teeth, in which he succeeded, and giving a sudden jerk he pulled the needle through the hide of the cat, where it hung by the thread which still held it from the inside. The remainder of the operation was performed by a daughter of Mr. Crawford, who pulled the thread through and stuck the needle in the fence close by. The joy of Carlo knew no bounds, and, frisking his bushy tail about, and rubbing his shaggy sides against his master, he showed his full knowledge of what he had done by going to the cat and licking the wound in the neck, and then to the needle in the fence, which he examined very minutely, saying, in actions almost as plain as words, 'See what I did.' A son of Mr. Crawford, coming home from his labor, was met by Carlo, who turned and ran to where the needle was, and smelled it as if to explain the case more fully to the new-comer."

Dr. Benjamin Lee, of Philadelphia, commenting on the above in the *Medical Times* of that city, remarks: —

"'Go to the ant, thou sluggard!' says the wise man, to inculcate a lesson of diligence. 'Go to the dog, thou stupid!' we may say to the surgeon, who on a similar emergency to the one recorded above would undoubtedly have attempted to remove the foreign body by its avenue of entrance. Apart from the wonderful interest of the story as witnessing to the animal's sagacity or reasoning powers, it is a remarkable tribute to the surgical possibilities of manipulation (Carlo's tongue was simply his substitute for a hand), pure and simple, — a veritable triumph for the movement-cure. It also indicates a mode of procedure for the extraction of a needle from the œsophagus which is entirely free from the danger of laceration so often produced by our blind and bungling and more violent efforts. I will simply add that I have taken pains to verify the relation, and have had the extreme pleasure of taking Carlo's paw and giving him the salutation of a *confrère*."

THE GRAPE CURE.

The London *Lancet* gives the following account of one of the most popular of Continental "cures": —

"The head-quarters of this remedy are at Meran, in the Tyrol, of which province it was some time the capital. Apart from the specific benefits of the 'cure,' Meran has much to recommend it in the way of climate, to which, we suspect, the grape treatment owes not a little of its efficacy. In August, September, and October, its population of 4500 is considerably reinforced by German, Russian, and Italian visitors, who, with a sprinkling of English and Americans, have come for the 'cure.' Accommodation is comfortable and cheap — cheaper, while not less comfortable, than in most of the Italian and French places of resort. Invalids suffering from chest affections — bronchitis or consumption in its pretubercular stage — are the chief subjects of the grape treatment. Less than 3 lbs. of grapes a day is not enough for efficacy. The patient begins with 1 or 2 lbs. per diem, dividing the quantity into three portions — one taken an hour before breakfast, the next before dinner, which comes off at 12.30 or 1 P. M., and the last in the afternoon or evening. The grapes are eaten *sub Jove frigido*, and after two or three days the quantity is increased by half a pound until it reaches 3 or 4 lbs. This amount often suffices the patient, who finds, as a rule, that he gains in weight and in strength also. Chronic liver complaints, especially when due to excesses in wine-drinking, are, it is said, markedly relieved by the 'grape cure,' the potash salts in the fruit supplying the element which the wine, in the process of manufacture, has lost. Hepatic dropsy has been known to be mitigated in this way. Patients should not be discouraged if, after the first day or two, they feel not so well as they were before; while one signal point in favor of the 'cure' is this, that no special diet is enforced. Indeed, the grapes themselves become so satisfying that indulgence in other food is hardly necessary. Before trying the cure, however, the patient should have his case thoroughly examined by his physician, who will tell him how and to what extent he may avail himself of the 'Natur-therapie' of Meran."

NOTES FROM ABROAD.

Hypnotism in Crustaceous Animals. — In a paper published in the *Sitzungsberichte der Wiener Akademie*, Professor Johann Czermak relates some curious hypnotic effects he has observed in certain crustacea. His attention was drawn to the subject by a paper in which it was stated that if the ordinary crayfish were held firmly in the hand, and magnetic passes made down its back, care being taken not to touch it, the animal soon became quiescent, and would permit itself to be placed on its head, where, if balanced by its nasal spine and chelæ, it would remain for a considerable period. On being unmagnetized by reverse passes, the animal, it was said, again resumed its activity. Professor Czermak was induced to study these phenomena a little more closely, and soon found that the magnetic passes had nothing to do with the phenomenon; but the fact remained, that if the animal were firmly held, in spite of some struggling, with its head downwards for some time, it gradually became quiescent, and would long continue balanced in the mode above described, as though it were asleep. The mere retention of the animal upon its back, the first struggling movements being prevented, was followed in the same way by a period of quiescence of considerable duration, from which the creature awoke either spontaneously, or on the application of a strong stimulus. Further experiments showed that all active movements and response to ordinary stimuli could be prevented in the crayfish by keeping it forcibly quiet for a time, either by binding it, or by fastening it between wooden pincers. Czermak made some experiments corroborating the well-known action of a chalk line drawn from the beak forwards, or from both eyes outwards, on fowls, and which he says struck him with the utmost astonishment when he first observed its effects, the fowl remaining breathing violently, but perfectly quiet and incapable of reacting to ordinary stimuli. He found, however, that the chalk line was unnecessary, all that was required being to restrain the animal's efforts at escape on being first caught, and then quietly to stretch the neck and put the head in contact with the ground. By this means not only fowls, but geese, ducks, turkey-cocks, and swans, could be rendered quiescent, and apparently made to lose all voluntary control over their movements.

THE SECRETION OF THE GASTRIC JUICE. — It has been considered as pretty well established that the secretion of the gastric juice is intermittent, occurring only when the stomach is irritated by some mechanical or chemical stimulus; but some experiments by Dr. Braun, recorded in a German medical journal, indicate that the fluid is secreted continuously. He produced gastric fistulæ in dogs, and having irritated the mucous membrane of the stomach with sponges, gravel, alkalies, and bits of meat, he found that the amount of secretion, estimated by removing it with a sponge, was unaltered in each instance, nor was it increased by the presence of the saliva either of dogs or of man. Moreover, no relation was found between the secretion of saliva and of the gastric juice; for a stimulus which increased the amount of saliva did not increase that of the gastric juice, and *vice versâ*. According to Braun, the mucous membrane of the stomach is but rarely covered with mucus; usually it secretes a fluid which has an acid reaction. If fluid — for example, a 1 to 2 per cent. solution of urea, or a 1 per cent. solution of common salt — be injected into the femoral vein in large quantities, the gastric juice becomes more abundantly secreted; and that the increased secretion is really gastric juice is shown by its acid reaction and by its digesting albumen. The *London Medical Times and Gazette* remarks that "Dr. Braun's experiments are interesting and extremely important if confirmed by other observers, but there is the positive evidence of such men as Beaumont and Claude Bernard on the other side, which should make us hesitate in accepting them too eagerly."

CURE FOR BURNS. — Comte de la Tour du Pui says that a pretty strong solution of ammonia in water is an excellent remedy for burns in cases where the skin is not destroyed. Having by accident taken hold of a crucible which was nearly red-hot, he plunged his hand into some ammoniacal water, and kept it some hours afterwards covered with a piece of linen soaked in the same; the pain was allayed almost immediately, and no blisters or suppuration occurred.

INJECTION OF CHLORAL INTO THE TRACHEA. — At a recent meeting of the Société de Biologie, M de Bellesme suggested the introduction of chloral into the system by this means in cases where the circulatory and absorbent functions are almost in abeyance, and where therefore subcutaneous or intravenous injections cannot be practised with reasonable hope of success. The process simply consists in inserting the needle of a hypodermic syringe into the trachea, at a point about one finger's-breadth below the cricoid cartilage, and slowly injecting the solution, which can be used in much larger quantities than by the subcutaneous method. This method is likely to prove serviceable in tetanus, hydrophobia, and the algid stage of cholera.

WASHING OUT THE STOMACH. — Dr. C. Ewald, of Berlin, describes a method of washing out the stomach, which, on account of its great simplicity, seems likely to make the topical treatment of diseases of the stomach, especially in cases of poisoning, much more common. "A piece of ordinary india-rubber tubing, such as is used for gas-lamps, about six feet long, is used; one end is rounded with scissors, and, if necessary, two holes are cut at a short distance from the end. This tube possesses quite sufficient rigidity to be passed without difficulty into the stomach. To the outer end a funnel is fitted, into which can be poured either water or a solution of soda, etc., according to circumstances. If the contents of the stomach are to be removed, the outer end of the tube must be sunk to the level of the pubes, or even lower; then the patient must make a short but forcible contraction of the abdominal walls. By this means the tube is filled to its highest point with the fluid contents of the stomach, and becomes a siphon; the liquid continuing to flow until there is no more, or till the tube is stopped up. This last seldom occurs, if the tube be of a moderate calibre. Should it, however, happen, or should the abdominal pressure be insufficient to fill the tube in the first instance, or the patient be insensible, or any similar difficulty arise, it can, in general, be readily overcome by fitting a common clyster-syringe to the end of the tube, one stroke of the piston of which is generally sufficient to remove the difficulty."

MEDICAL MEMORANDA.

WRITER'S CRAMP. — P. W. Sheafer, Esq., of Pottsville, Pa., writes us as follows: "Noticing the article on 'Writer's Cramp' in your excellent journal for July, I beg to say, since I abandoned the use of *metallic* pen-holders and adopted those of *gutta-percha* I am no longer troubled with cramp. Formerly the galvanic effect of the metal, as I believe, extended from the fingers to the shoulder, almost disabling me from use of the pen. Some four years since I began the use of gutta percha holders, and now write with ease, though never well. Hoping my experience may benefit others similarly afflicted, I send you this."

REMEDIES FOR STINGS. — Among the various cures recommended for bee stings are liquor potassæ, olive oil, vitriol, laudanum, vinegar, honey, saleratus and water, salt and water, soft soap and salt, raw onion, tobacco juice, a paste of clay or flour, the expressed juice of any green leaf, or of the ripe berries of the coral honeysuckle. The poison of a bee being acid, an alkali must be employed to neutralize it. If, therefore, we were selecting for trial any of the above so-called remedies, we should choose either soft soap or ammonia. But if the individual stung is not very nervous, cold water applied to the wound will be quite sufficient, and it should not be rubbed. One great essential is, if heated, to get cooled as soon as possible, and to avoid becoming heated again for at least two days. Nothing is so apt to make the poison active as heat, and nothing favors its activity less than cold. Let the body be kept cool and at rest, and the activity of the poison will be reduced to a minimum. Any active exertion, whereby the circulation is quickened, will increase both pain and swelling.

ALCOHOL IN POPULAR "BITTERS." — We need not inform our readers that the various "bitters" sold so extensively owe their popularity in no small degree to the alcohol they contain. Thousands of people who would never touch ardent spirits in their ordinary forms take these disguised drams habitually. Mr. Henry Vaughan, State Assayer of Rhode Island, has lately made an analysis of thirty-five varieties of these "bitters," including all the favorite "brands" in the market. He finds that the amount of alcohol in them varies from 6.36 to 59.14 per cent. Twenty-three out of the whole number contain more than 30 per cent., while only six fall below 20 per cent.

THE FIRST JAPANESE M. D. AT A EUROPEAN UNIVERSITY. — Foreign journals state that Susum Sato, son of the private physician of the Mikado of Japan has lately received his M. D. degree at the University of Berlin. He passed a very creditable examination, read a dissertation on diarrhœa in young children, and sustained his various theses with great ability, and in very good German. He then addressed the usual application in Latin to the authorities for his doctor's degree, which was duly conferred on him after some compliments from the dean on the circumstance of his being the first of his countrymen admitted to this distinction.

SICK HEADACHE. — Dr. R. H. McKay, of Tennessee, writes to the *Medical and Surgical Reporter:* For the benefit of those who suffer with headache, I ask you to publish the following formula, the efficacy of which I have tested time and again: Granulated muriate of ammonia, one teaspoonful; morphiæ acet., gr. j.; water, lb. ss. Sig. Dose for an adult, two teaspoonfuls every ten minutes (precisely) till relief is obtained.

OXIDE OF ZINC FOR NIGHT SWEATS. — The *Pacific Medical and Surgical Journal* remarks that the most ancient and venerable remedy for night sweats is aromatic sulphuric acid, in infusion of cinchona, serpentaria, or sage. The best of all remedies, however, is this: Oxidi zinci, gr. xxx.; ext. hyoscyami, gr. xv. M. f. pil. x. Sig. Take one at bed-time.

SELECT FORMULÆ.

PILL COATING. — In the *Pharmaceutical Journal*, Mr. J. A. Cope, Derby, and Mr. J. Whitfield, F. C. S., Scarborough, give formulæ for pill coating. The former recommends, first, to sufficiently moisten the pills (which should be perfectly round and not too hard) with a thin mucilage. One part mucilage (B. P.) and two parts water is sufficiently dense. They are then to be turned into a gallipot containing some powdered French chalk, and shaken round well for a few seconds, and, after lying out for a short time, again shaken round in a clean gallipot in order to remove superfluous chalk and polish them.

Mr. Whitfield's process is similar, but instead of the mucilage he recommends a varnish composed as follows:—

Common amber resin	1 to 2 drachms.
Spirit of turpentine	1 drachm.
Oil of geranium	20 minims.
Absolute alcohol	To make 1 ounce.

The oil of geranium may be omitted or substituted by other essential oils, at discretion. The pills should be made as hard as possible.

A GOOD ANODYNE. — An English journal gives this formula: Alcohol, one quart; gum guiac., one ounce; gums myrrh and camphor, and cayenne pulverized, each half an ounce. Mix and shake occasionally for a week or ten days, and filter or let settle for use. Apply freely for surface pains, or it may be taken in teaspoon doses for internal pains.

CINCHO-QUININE. — J. S. Watts, M. D., of Xenia, Ohio, writes as follows, under date of August 12, 1874: "Having been a constant subscriber to the JOURNAL OF CHEMISTRY since its first publication, I have naturally become interested in the many valuable productions of chemicals made by you and your predecessors (Jas. R. Nichols & Co.). Important amongst them is cincho-quinine, which was first brought to my notice several years ago, whilst practising medicine in Michigan. I sent for a sample package for trial, and found it to answer the purpose in every particular for which you recommend it. I am satisfied that it is a very much better *tonic* than the sulphate, and as an anti-periodic there is nothing that excels it. It has a much better effect generally on the system than the sulphate, producing less cerebral distress, and being more acceptable to the patient. I am using it constantly in my practice. The trouble in dispensing the sulphate to women and children is obviated in the use of this valuable chemical; the slight bitter is not disagreeable to the most sensitive stomach. For children a very palatable way of using it is to triturate it with powdered sugar, namely, cincho-quin. gr. j.; sacch. alb. grs. iij. I am free to say that in the introduction of cincho-quinine to the medical profession you have met a want long felt by them, and which they are sure to appreciate."

Orson Millard, M. D., of Flint, Mich., writing August 15, 1874, says: "Living in a malarious district, and having ample opportunity to test the virtue of all kinds of anti-periodics, I can say that cincho-quinine is a remedy not inferior to the old sulphate of quinia, much cheaper, and vastly more pleasant to the taste."

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Familiar Science.

SOME THINGS ABOUT RAIN.

IN the last number of the JOURNAL we devoted one of these familiar papers to the consideration of the "water atmosphere," which is coextensive with the aerial one that enwraps this round world of ours. We are now prepared to explain how this floating aqueous vapor is condensed into rain, and why the rainfall (as shown by the facts given in another paper more than a year ago) is so unequally distributed, even within limited districts where we should naturally expect it to be quite uniform.

We have seen that the amount of watery vapor that the air can hold depends upon its temperature. When saturated with moisture it must give up a portion of it if the temperature falls. Whatever cools the air may therefore be considered as a cause of rain. It is chiefly due to the ascent of air into the higher regions of the atmosphere. Moist air-currents are forced up into the higher parts of the atmosphere by colder drier, and therefore heavier wind-currents which get beneath them. Ranges of mountains also oppose their masses to the winds, so that the air forced up their slopes is cooled, and its vapor condensed into showers of rain or snow. The air as it rises is chilled by its expansion as well as by the lower temperature of the region into which it ascends. The deposition of vapor on the sides of a glass receiver which is being exhausted by an air-pump is a familiar illustration of this fact. The air is cooled as it becomes rarefied, and has to yield up a part of its vapor.

The temperature of the air is also lowered, and the rainfall increased, by winds that convey the air to higher and colder latitudes. This occurs in temperate regions, or in those traversed by the return trade-winds, which north of the equator blow from the southwest, and south of it from the northwest. The meeting and mixing of winds of different temperatures is also a cause of rain, since the several portions when combined cannot hold as much vapor as before. The rainfall is also increased if the prevailing winds are directly from the sea and therefore moist; but it is diminished if they have passed over large tracts of land, particularly mountain-ranges, and are therefore dry. The quantity of rain is likewise influenced by sandy deserts, which allow radiation, by day or night, to take immediate effect in raising or depressing the temperature; and also by forests, which retard or counteract radiation.

Of the agencies that affect the distribution of the rainfall, the most important are mountains. These, as we have remarked, act as condensers of the atmospheric vapor, and air-currents that reach them heavy with moisture are plundered of their watery treasures as they climb the rocky slopes, and have little or nothing left for refreshing the thirsty plains on the farther side. In the article to which we have referred above, i was stated that there are some regions where rain rarely or never falls; as the coast of Peru, the Sahara in Africa, and the desert of Gobi in Asia. All these rainless districts are made so by the mountains on their borders.

The Sahara is bounded on the north and on the south by ranges of mountains. When the northeast trade-wind strikes the northern range, a part of its vapor is condensed. As it moves southward, it reaches warmer latitudes, where there is a greater capacity for moisture. Since there are no opposing winds to force it upwards, it sweeps on across the vast sandy plain until it arrives at the southern mountains, where its vapor is precipitated in abundant rains. In the few spots in the desert where hills or mountains occur, there are occasional rains. On the desert of Gobi, the prevailing winds are from the southeast, and are very dry, because they have precipitated nearly all their moisture in passing over the Himalaya Mountains. The rainless district in Peru is caused by the Andes, which condense nearly all the vapor of the southeast trade-wind in copious rains on their eastern slopes.

The unequal distribution of rain in the British Isles, is another illustration of the action of mountains as condensers of the atmospheric vapor. Tyndall, in his "Forms of Water," thus refers to the heavy rainfall in the southwestern part of Ireland: —

"Imagine a southwest wind blowing across the Atlantic towards Ireland. In its passage it charges itself with aqueous vapor. In the south of Ireland it encounters the mountains of Kerry; the highest of these is Macgillicuddy's Reeks, near Killarney. Now the lowest stratum of this Atlantic wind is that which is most fully charged with vapor. When it encounters the base of the Kerry Mountains it is tilted up and flows bodily over them. Its load of vapor is therefore carried to a height, it expands on reaching the height, it is chilled in consequence of the expansion, and comes down in copious showers of rain. From this, in fact, arises the luxuriant vegetation of Killarney; to this, indeed, the lakes owe their supply. The cold crests of the mountains also aid in the work of condensation.

"Note the consequence. There is a town called Cahirciveen, to the southwest of Macgillicuddy's Reeks, at which observations of the rainfall have been made, and a good distance farther to the northeast, right in the course of the southwest wind, there is another town, called Portarlington, at which observations of rainfall have also been made. But before the wind reaches the latter station, it has passed over the mountains of Kerry and left a great part of its moisture behind it. What is the result? At Cahirciveen the rainfall amounts to 59 inches in a year, while at Portarlington it is only 21 inches."

The irregularities in the rainfall of the English "Lake District" are to be similarly explained. The mountains of Cumberland, like those of Kerry, act as condensers of the moisture brought by the southwest winds, so that the average rainfall at different points in their vicinity is from 90 to 180 inches, while in the east of England it is not more than 20 to 28 inches.

The heaviest rainfall known, as we have before stated, is on the Khasia Hills in British India. It averages 600 inches annually, 500 inches of which fall in seven months of the year. This extraordinary opening of the windows of heaven is yet another example of mountain condensation. These hills face the Bay of Bengal, from which they are separated by only 200 miles of swamps and marshes. Hence, the southerly winds not only arrive heavily laden with vapor from the Indian Ocean, but they get more moisture in passing over the 200 miles of swamp. They are therefore ready to burst in torrents, even before they are suddenly raised, by the hills they encounter, into the cooler regions of the atmosphere.

At places within the tropics, where the trade-winds blow regularly and steadily, the rainfall is small. Since these winds come from higher latitudes, the temperature is increasing, and they are thus more likely to take up moisture than to part with it. Where, however, they are forced up the slopes of mountain ranges, they bring abundant rains.

The tropical belt known as "the region of calms" is the region of constant rains. Here the sun almost invariably rises in a clear sky; but about midday clouds rapidly gather over the whole face of the sky and pour down prodigious quantities of rain. Towards evening the clouds disappear, the sun sets in a clear sky, and the nights are serene and fine. The reason of this is that the air, being greatly heated by the vertical rays of the sun, ascends, drawing with it all the vapor which the trade-winds have brought with them, and which has been largely increased by the rapid evaporation from the belt of calms; and this vapor is condensed as it rises. The rain is sometimes so copious that fresh water has been collected from the surface of the sea. As evening sets in, the surface of the earth and the air near it being cooled, the ascending currents cease, and the cooled air descends; the clouds are thus dissolved, and the sky continues clear till the returning heat of the following day.

Over a great part of the tropics disturbing influences draw the trade-winds out of their course, and sometimes, as in the case of the monsoons, give rise to winds from the opposite point of the compass. But for these winds the eastern districts of Hindostan would be constantly deluged with rain, and the western districts constantly dry and arid. As it is, each part of India has its dry and wet seasons, summer being the wet season of the west and interior as far as the Himalayas, and winter the wet season of the east, and especially the southeast.

We have lately met with a striking illustration of the effect that even a very slight elevation of land may have upon moist air-currents

coming from seaward. At Brighton, England, there is a pier 1115 feet long, at the end of which the rainfall for the year 1872 was only 23 inches, while at a point about 1100 feet inland from the head of the pier it was 38.52 inches; a difference of 15.52 inches at stations less than half a mile apart. For the year 1873, the figures were 14.55 and 26.74, showing a difference of 12.19 inches. The observations were made by an experienced meteorologist, with the aid of the best rain-gauges, and their accuracy is unquestionable.

We have by no means exhausted the subject, though we have exhausted the space we can afford it for the present.

CHEMICAL CHIROGRAPHY.

II.

Last month we described some of the "sympathetic inks" which are rendered visible by the action of heat or light. We will now give a brief account of a few that depend upon the action of a gas or solution to bring out the writing for which they have been used.

A decoction of nutgalls or a very weak solution of tannin is a simple ink of this kind. Characters written with it will be invisible, but if the paper be washed with a solution of sulphate of iron, or "green vitriol," they become black, as if penned with ordinary ink. In fact, when the writing has been thus developed by the action of the iron salt it is virtually the same as if it had been done with common black ink. The only difference is, that in the latter case the solutions of tannin, or tannic acid, and sulphate of iron are mixed in the inkstand, before the writing is done. Most of the black inks in common use are made in this way. Pure sulphate of iron, or ferrous sulphate ($FeSO_4$), and tannic acid might be mixed without change; but when the mixture is exposed to the air, oxygen is absorbed, converting the ferrous oxide (FeO) into ferric oxide (Fe_2O_3), which unites with the tannic acid to form a black precipitate of ferric tannate (or "tannate of sesquioxide of iron," to use the old nomenclature), a salt whose exact composition is not perfectly understood. It is on account of this gradual oxidation that the writing when washed with the iron solution is at first pale and becomes black by degrees, as is also the case when certain common inks are used.

Another simple writing fluid of this kind is a solution of acetate of lead, or "sugar of lead." To make the writing appear, expose the paper to the action of sulphide of hydrogen — either in the gaseous state or dissolved in water — when the characters become black; or wash the paper with a solution of bichromate of potash, which will render them yellow. In the former case, the black sulphide of lead is formed, in the latter the yellow chromate of lead.

Another black sympathetic ink is the result of writing with a dilute solution of bichromate of potash, and washing with a solution of extract of logwood. Some of the ordinary black inks are the result of essentially the same chemical reaction that occurs in this case.

For a red ink, soluble salts of antimony may be used, "developing" with sulphide of hydrogen. The sulphur of the latter combines with the antimony to form a sulphide of that metal. For a light blue ink, write with a dilute solution of sulphate of copper, or "blue vitriol," and expose the writing to the vapor of ammonia, or wash with aqua ammonia. For a dark blue ink, use a solution of iodide of potassium mixed with a little starch. The writing will be made visible by acid vapors or by the action of ozone. Another blue ink is furnished by a weak solution of nitrate of cobalt, with a solution of oxalic acid for developing the color; or the writing may be done with the latter and then washed with the former. If we write with a solution of chloride of gold and wash with a solution of a salt of tin, a rich purple — the so-called "purple of Cassius" — is obtained.

Many more of these chemical inks might be added if our space permitted, but those we have given will suffice as specimens. Occasionally they serve some practical use, as in the recent escape of Marshal Bazaine from prison. It is said that the arrangements for his flight were communicated to him by writing in sympathetic ink between the lines of an apparently unimportant letter, which passed the scrutiny of his jailers without being suspected.

LEARNING TO READ.

The importance of learning to read is universally conceded. The knowledge of the alphabet and its combinations is the key to a vast store of wisdom locked up in the arcana of literature; the thoughts and deeds of great men in the past, and a more or less complete knowledge of the present, are recorded in the books which become a source of exquisite pleasure to the reader. Learning to read is the first thing taught in primary schools, and its importance, we think, justifies that compulsory attendance upon such schools be required of every child born on our shores or living in our borders.

Suppose the span of human life were long enough for a man to read all the books ever printed in every language spoken on the face of the earth; suppose his memory was strong enough to hold all the facts thus acquired: could we say he had reached the limit of human knowledge? By no means. The amount of knowledge contained in all the books in the world is comparatively limited. There is, however, another book spread open to the gaze of all, which far surpasses all printed books in interest as well as in extent and variety. The book of nature has been skimmed a little here and there, a few pages have been studied, but the labor of learning to read it, the time required to spell out a few incomplete sentences, are so great that few have undertaken it and fewer still have met with any success. Fluent readers there are none. Facts are not so difficult to obtain, if care and patience are used, but naked facts are like the letters of the alphabet; they must be grouped together to form words. Even when the words are known, it is not easy to construe them into sentences so as to arrive at the meaning which they sometimes seem to conceal, rather than to explain.

The earliest man saw the sun rise in the east and set in the west, the moon and stars following the same course, just as we see them to-day; they early attracted his attention and he noticed certain irregularities in their movements, but it took him several thousand years to translate these facts correctly and to learn from observing the face of the heavens that the sun is the centre of the solar system around which our earth revolves. After Galileo had read this part of that one great sentence correctly, it took another century for Newton to read between the lines that the whole solar system was regulated by the simple law of gravitation.

Not only men, but birds, animals, and fishes possess the power of vision. We become aware, by the exercise of this power, that certain events are taking place at a considerable distance from us, and the question arises, "How do we see?" The men of old attempted to explain it by the supposition that something went out from the eye and grasped the object seen. This interpretation of the act of vision was rejected by those who followed, and who claimed that some substance emitted by the object flew into the eye, just as particles of odorous bodies enter the nostrils and produce the sensation of smell. The corpuscular theory of light, as this was called, although defended by the great Newton, has now been abandoned, and the vibratory theory substituted. The letters and words are before us; how shall we interpret them? It is a question of learning to read nature, to correctly interpret facts and from them deduce the laws of nature, which have been called the thoughts of God.

We have good reason to believe that the astronomers of to-day are reading correctly many of the facts spread before them in their own chapter of the great book. They have reached a point where that great lexicon, the exact science of mathematics, comes to their aid. Would that we could say as much of many other sciences.

For centuries men have been delving into the bowels of the earth for the metals and precious stones. The great book of geology was open for study, but people could not read it, and its truths were, of course, hidden until men had learned to examine, study, classify, and draw conclusions. Man has at length progressed so far in the alphabet of nature that it is a comparatively easy task to decipher the hieroglyphics of geology, not, indeed, with certainty, for even yet some doubts exist as to the correct reading of certain sentences in this chapter, but far enough to teach us important and unexpected truths.

In chemistry the vocabulary is a hard one, and is not easily understood, while the sentences are complicated and obscure. Little by little sentences are deciphered, as new investigations throw light upon obscure points. Facts are accumulating in immense numbers, but the key has not yet been found. From the rings produced by the reflection of light from a convex lens placed on a smooth surface, the physicist has deduced the length of a wave of light, and his reading of the facts seems perfectly satisfactory. From the colors and bands seen in the thinnest possible film of a soap-bubble, the thickness of such films has been quite accurately calculated; and from these data Sir William Thompson has arrived at the conclusion that a molecule of water is not less than one five-thousand-millionth part of an inch, nor more than the two-hundred-fifty-millionth of an inch, in diameter. Such is to-day the reading of these few facts from the colors seen in soap-bubbles, and other thin films. It is only one illustration of the power of generalization and deduction. While we accept these results as approximate truths, we must remember that human judgment is fallible, and while experiments carefully conducted will establish facts, we must use the greatest caution in interpreting these facts. Two of the most original and careful experimenters of the last century were Scheele and Priestley, yet they firmly believed in the theory of phlogiston. In 1774 the former discovered chlorine, the latter oxygen, and the investigations of Priestley led to results which we now see almost proved the untenability of the phlogistic theory, yet he interpreted them as proofs of his favorite system. With the true facts before him, this clear-headed and original thinker erred in his interpretation of them. He had only partially learned to read.

The original investigator in every science is seeking facts, and each new fact discovered adds so much to our stock of knowledge. He is like the

antiquarian who unearths ancient inscriptions and hieroglyphics, which are of themselves curious and interesting, but which require to be translated before they can benefit the world. While we accept their gifts we reserve to ourselves individually the right to criticise their interpretations, for no human authority is infallible in this regard.

Reason, therefore, is the highest faculty, because it enables us to read and understand the great book of nature, and it is our duty to exercise it.

E. J. H.

NATURAL HISTORY NOTES.

Number of Eggs in the Sturgeon. — Mr. Frank Buckland states, in *Land and Water*, that he has lately had the opportunity of examining the viscera of a sturgeon caught at Selby in Yorkshire. The following is an extract from his article on the subject: "The eggs filled a very large iron pail; they were surrounded by a white, milky substance, the exact nature of which I do not understand. Each egg is perfectly round, and about the size of ordinary partridge shot. The fish weighed one hundred and seventy-one pounds! The length was seven feet nine, girth five feet three. Mr. Searle, my secretary, and myself have carefully weighed the eggs, and the result is that there were forty-five pounds' weight of eggs. By boiling them and spreading them out on paper, we found that there were 1280 eggs to the ounce; thus the total number of eggs contained in this one sturgeon amounted to the vast amount of nine hundred and twenty-one thousand six hundred (921,600). When the reader is eating *caviare* he will have some idea of the number of young sturgeons that are thus destroyed at a single mouthful in the form of eggs. It is a most remarkable thing that a creature of such a gigantic size as a sturgeon should germinate originally from an egg no bigger than a partridge shot. It is a greater wonder than an oak from an acorn."

Wonderful Leap by a Deer. — An Irish journal gives an account of a tremendous leap taken by a deer belonging to Mr. Gubbins, the master of the Taglioni Staghounds, county Limerick. The master a few mornings since was in the paddock engaged in separating the bucks from the does, when one of the former (his best) quietly walked up to the boundary wall, which is 13 feet high, and cleared it at a bound. Loath to lose such an animal, Mr. Gubbins decided on hunting him, and accordingly two good hunters and six couple of picked hounds were selected, and laid on at once outside the wall. They immediately hit off the scent, and after a run of two hours the truant was safely taken. The jump over the wall was certainly an extraordinary performance. An English red deer stands about 4 feet high, so that this animal must have cleared more than three times its own height.

Dog Hams. — The Chinese, it is well known, have more curious habits and customs than any other people under the sun; fatting dogs for the purpose of human food is one of them, and one in which considerable trade is done. Mr. Cooper, who has been laboring to establish an overland route from China to India, says that one morning, as he was sitting down to breakfast at a "tea-shop" in Hung-zachien, in the country of the Upper Yang-tsu-Kiang, he was informed that he was in luck, as the proprietor just then happened to have a dog-ham in cut, some slices of which he should have fried, a delicacy reserved only for mandarins like himself. At first he was on the point of ordering away the horrid dish, but, on second thoughts, he proceeded with "stoical fortitude to taste doggie; one taste led to another," and, in summing up, he pronounced the dog-ham to be delicious in flavor, well smoked, tender, and juicy. "It was small, not much bigger than the leg of a good-sized sucking-pig; the flesh was dark, and the hair had been carefully removed, while the paw had been left as a stamp of its genuineness, as the proprietor remarked. Dog-hams are justly considered a great delicacy in China, and as such bring a very high price, costing as much as five taels (1 tael = $1.66) per pound. They are chiefly cured in the province of Hoonan, where dogs of a peculiar breed are fattened for the purpose. Hoonan is also famous for its pigs, and possesses a large trade in bacon and ham, especially in pig-hams which have been cured in the same tubs with dog-hams, and are thereby considered to have acquired a finer flavor."

How they Deal with Grasshoppers in Cyprus and Algeria. — General Chanzy, this past season, issued a circular to the generals of division and prefects in Algeria, directing them, in dealing with these public pests, to adopt the method which has been successfully employed in Cyprus. This comprises systematic seeking and destroying of the grasshoppers' eggs, and also attacking the crickets on the march. It seems that before becoming full-blown grasshoppers the crickets, about a month after they are hatched, begin to march, and this they do in large, compact masses for a period averaging some twenty-seven days, during which they never swerve from the line of route once adopted. The people of Cyprus take a band of silk, from 65 to 70 centimetres high and 100 metres long, and this they tie vertically to poles firmly fixed in the ground, the upper part being waxed or bordered with oil silk to a width of about 10 centimetres, and the earth so heaped up under it as to leave no crevice between the silk and the ground. A second band is then set up, so as to form a sort of gallery of gradually diminishing width, being at the mouth somewhat wider than the column of crickets, but only five metres wide at the other end, where is a trench five metres long, one and a half wide, and one deep. This forms the trap or "system" several of which, 100 metres long, can be placed end to end and transported to any point threatened by the invaders. All that has to be done is to wait till the column of crickets has reached the trench. Then it is covered in with earth, and nothing more is seen of the crickets.

SCIENTIFIC BREVITIES.

Earth-Shrinkings and Terrestrial Magnetism. — Mr. H. H. Howorth, in a letter to *Nature*, expresses the opinion that the earth is shrinking chiefly about its equatorial region, and is being thrust out in the direction of the poles, and that the distribution of this force may be correlated with that of terrestrial magnetism. It is to a great extent proved that volcanoes are not found in areas of upheaval, but are indicative of areas of depression; also that the earth as a whole is shrinking. Volcanoes are most numerous in the equatorial regions, and constantly increase in numbers as we approach the equator from the poles. "It is a remarkable fact," says M. Reclus, "that the two volcanic groups of the Antilles and the Sunda Islands are situated exactly at the Antipodes one of the other, and also in vicinity of the two poles of flattening, the existence of which on the surface of the globe has been proved by the recent calculations of astronomers." Mr. Howorth quotes from Dr. Zöllner's paper in the *Philosophical Magazine* on the correlation of earthquakes with magnetic disturbances, wherein it is stated that Kriel has given many cases where magnetic disturbances coincide with earthquakes; hence, he thinks, connection between the two phenomena probable.

Time by Telegraph. — The telegraphic apparatus at the Naval Observatory at Washington is now connected with the main lines of the Western Union Telegraph Company, so that not only is the time-ball dropped daily at noon, but the same signal is widely distributed by the telegraph company. It goes directly from the observatory to the main office in New York city, and thence it is sent to nearly every State in the Union. The immediate object of these signals is to furnish accurate and uniform time to the railroads, and throughout the whole vast territory in question there is scarcely a train whose movements are not regulated by the observatory clocks. The clocks at the Navy Department, at the Army Signal Office, at the Treasury Department, and at the Western Union Telegraph Company's offices, are all directly controlled by electric currents sent every second by the standard clock of the observatory.

Improvements in Military Telegraphy. — The *Journal Télégraphique* describes the system recently patented by M. Lemasson in France. Its chief feature is the capability of being rapidly set up, an all-important requirement for military telegraphy. The posts are each made in two or three sections, fitting into one another, thereby allowing them to be reduced to a half or a third their greatest height. The lowest section, in order to facilitate erection, is provided at its extremity with a steel point; the upper section is furnished with ebonite insulators, which screw on to the end of the posts. Steel fastening collars, or rings, fitted with screws to press and contract the collars, bind together the sections and permit the height to be regulated according to the exigencies of the service. On a march the posts may be taken to pieces, and therefore more easily handled than is the case otherwise, especially when, as in steep and rugged roads, they have to be transported on the backs of mules. The construction of a line on ground open to fire can be carried out at the height of a man without need of ladders or exposure of men. Once so constructed, it is simply necessary to raise by hand the different sections, and fix them to the lower sections by means of the steel collars at the desired elevation. Similarly in the case of breakage the broken portions can be easily lowered and repaired. Experiments on different grounds prove that by this system lines can be erected at the rate of two kilometres the hour, or quick enough to follow the movements of a *corps d'armée*.

Spirits of the Mine. — A few weeks ago, according to *Iron*, large numbers of the miners employed at some of the Bedworth collieries, in North Warwickshire, giving way to a superstition which has long prevailed amongst their class, refused to descend the coal-pits in which they are employed. The men are credulous enough to believe that certain nocturnal sounds, which are doubtless produced by flocks of birds in their passage across the country, are harbingers of some impending colliery disaster. During Sunday night it was stated that these sounds, which have been designated "the seven whistlers," had been distinctly heard in the neighborhood of Bedworth, and the result was that on the following morning, when work should have been resumed, many of the men positively refused to descend the pits, and were to be seen on Monday idling about the streets of the town. The recent colliery accidents at Bedworth, and the "sounds" by which they are said to have been preceded, seem to have augmented, rather than diminished, this superstitious belief. Such superstitions, as we have before remarked, are common among the German miners, who have peopled the gloomy recesses of the mine with all kinds of weird spirits, kobolds, and the like.

An Optical Delusion. — A correspondent of *Nature* says: The following is an optical delusion which is none the less interesting for being very easily explained. Let a person standing before a looking-glass look attentively at the reflection of the pupil of one of his eyes, and then at that of the other; let him look at different *parts* of the eye, and from one eye to the other, first at one and then at the other. Knowing that in thus changing the direction of his gaze his eyes *must* move about in their

sockets, he will expect to see that they do so in the glass. As a fact *they will appear perfectly still.*

If he looks at the eyes of another person trying the experiment, the peculiar fixedness of his own will be still more striking, when he looks at them again.

HOUSEHOLD HINTS.

A Simple Plan of Ventilation. — The following simple method for ventilating ordinary sleeping and dwelling rooms is recommended by Mr. Hinton in his "Physiology for Practical Use": "A piece of wood, three inches high and exactly as long as the breadth of the window, is to be prepared. Let the sash be now raised, the slip of wood placed on the sill, and the sash drawn closely upon it. If the slip has been well fitted, there will be no draft in consequence of this displacement of the sash at its lower part; but the top of the lower sash will overlap the bottom of the upper one, and between the two bars perpendicular currents of air, not felt as draft, will enter and leave the room."

Leaf and Flower Impressions. — Oil a piece of white paper on one side; hold the side that is oiled over a lamp or pine-knot smoke till quite black; place the leaf on the black surface, as the vines and fibres of the leaf show plainer on the under part; now press upon all parts of the leaf with the fingers; then take up the leaf and put the black oiled side on the page of a book (made for leaf impressions) with an extra piece of paper on the top to prevent smutting the opposite page; press it a few moments; then remove the green leaf, and the impression will be left on the page as beautiful as an engraving. Flowers of single corolla can be pressed in like manner. Many of the geranium leaves make beautiful impressions. The impression book may be made still more interesting by giving botanical classifications of each leaf and flower.

Preserving Cut Flowers. — In an article on this subject in *The Garden*, of London, we find the following, which may be new to many of our readers: "Another point connected with the duration of flowers in a cut state deserves more attention than it has hitherto received, and that is prevention of the flowers from becoming fertilized, as they seldom last long — even when left on the plants — after that takes place; besides, the pollen of some flowers, more especially that of lilies, has a bad odor, and soils the purity of the petals when shed on them. Cultivators are aware of this fact, and either remove the anthers or stigma with a sharp pointed pair of scissors, or give them a dexterous touch with a gum brush, so as to prevent the escape of the pollen. Flowers so treated last much longer than those allowed to take their chance in the usual way, for it is a fact that many flowers droop as soon as the pollen is shed or the stigma fertilized. This is the case with phalænopsids and other orchids which, under ordinary circumstances, last fresh for fully a month or six weeks; but as soon as a flower is fertilized — either intentionally, by insect agency, or by accident — the petals wither and collapse, and the flower quickly fades. Gumming is also resorted to by bouquet-makers in the case of azaleas, zonal and fancy pelargoniums, rhododendrons, and other flowers of a fragile character. The process is extremely simple — a drop of gum or prepared mucilage is allowed to fall down into the centre of each flower; and after several are thus operated on they are placed in rows to dry. The gum sets in a mass at the base of the petals, and firmly unites them to the base of the stigma, so that the flowers last much longer than they otherwise would do, and the danger of the petals falling at an unlucky moment and leaving an ugly hole in the bouquet, wreath, vase, or other arrangement is, to a great extent, obviated."

Practical Chemistry and the Arts.

THE ENGLISH MANUFACTURER.

It is said that a lot of Japanese idols recently sold because their pagan owners "had no further use for them," were found, on examination, to be of Sheffield manufacture; and this is but one out of many illustrations of John Bull's shrewdness in finding out what is wanted in foreign markets, and his readiness in supplying the demand, whatever it may be. Brother Jonathan has the reputation of being "pretty cute," but he is no match in this respect for his solid and respectable old progenitor across the water.

As another writer has well said, "the English manufacturer does not strive to educate tastes, but to cater to those already formed. He does not try so much to build up markets, as to supply those already established. In short, he works to furnish the goods that people want. He reads in a new work of foreign travel that some peculiarly colored beads are wanted by the natives of Ethiopia, and in a few weeks a caravan of camels laden with them is crossing the Great Desert. He knows that Sheffield wants ivory, so a handful of beads is exchanged for an armful of elephant's tusks. He searches the papers for 'rumors of wars,' and before conflicts have commenced, his cannon, powder, and bunting for battle-flags are ready to sell to each of the belligerent nations. He makes ships to carry these articles, and so fashions them that they may be converted into men of war. He watches out, too, for Peace Jubilees, and is ready with a full supply of drums and bugles.

"The English manufacturer is a Christian of the Established Church, but hearing of a demand for wood and brazen images on the part of the heathen in Central India, he turns out a quantity of them and sends them in the next ship bound to Calcutta or Bombay. He learns that the Mohammedans are to erect a mosque at Delhi, and he gets the contract for the metal roof and cornices. In the mean time he is doing a brisk business in furnishing Catholic churches with golden candlesticks, and with the candles to burn in them. In principle he may not believe, any more than his fathers did, in the right of 'all men to worship God according to the dictates of their own consciences,' but he does believe that 'everything is fair in trade,' and he resolves not to lose any money because everybody does not believe in religious matters the same as he does.

"The English manufacturer is a patriot, and believes with Nelson in doing his duty when his country requires it. But for all this, he sees no inconsistency in making yellow badges for the Orangemen in North Ireland, or in dyeing green cloth and ribbon for the use of the Catholics of South Ireland, who wish to make merry on St. Patrick's Day. In truth, he little cares whether the rockets and fire-works he makes are shot off on Bunker Hill, to commemorate the day the independence of the American Colonies was declared, or are lighted in Hyde Park to celebrate the execution of Guy Fawkes, or the birth of another prince. His success, aside from the fact that he has acquired an excellent reputation for making good articles, lies entirely in his tact in finding out what goods, and just what kind of goods, are wanted in the markets of the world, and in supplying the demand. This is the secret of the wealth and prosperity of English manufacturers to-day."

MEMORANDA IN THE ARTS.

Artificial Down and Cloth from Feathers. — In Paris "artificial down" has come to be more highly valued than the natural down, because it is much lighter. It is made from feathers of any kind by cutting the barbs of the feather from each side of the quill, putting them in a stout cloth sack, and rubbing them between the hands, as a washerwoman does linen. Five minutes' rubbing will have mixed the mass into a felt-like substance, rendering it homogeneous. That is *édredon artificiel*, and sells in Paris for something over $8 in gold a pound, and this price is constantly increasing. A process has also been invented for making cloth of feathers. To make a square metre (a metre is 39.3 inches) of cloth lighter and warmer than wool, from 700 to 750 grammes (a gramme is 15.4 grains) of this down are required. But this *drap de plume* takes color admirably, and wears wonderfully, because, instead of breaking and cutting in the places most exposed to wear, it mats itself more and more into a felt-like substance. The estimate has been made that in France alone enough feathers are allowed to go to waste each year to make from 7,000,000 to 8,000,000 square metres of cloth. In other words, as much is lost in France in feathers as is paid for cotton.

Horse Cars in Paris. — The horse railway just opened in Paris promises to be very popular and successful. The cars are small, being arranged for twenty-eight passengers, ten of whom stand on the platforms; but (and here is a suggestion for an improvement in our own horse-car system) those who stand are counted as second-class passengers and pay a reduced fare. The cars are drawn by one horse, but a second is attached in going up hill. The prices are according to distance, being four, eight, and twelve cents (this last for about seven and a half miles) for the first class, and half as much for the second class. Other lines are soon to be opened.

Narrow-Gauge Railways. — It has been stated in "the papers," that the narrowest gauge in this country is that of the railroad at Mount Union, which has a width between the rails of 27½ inches. There is, however, one narrower still, namely, the Peekskill Valley Railroad, which is of 24 inch gauge, with five and a half miles in operation. The locomotive employed on the same weighs 8000 pounds. There appears to be almost as much variation in gauge in the narrow as in the broad lines. For instance, we have in the United States, apart from the standard narrow-gauge, of which the Denver and Rio Grande Railroad is a type, the Peekskill Valley of 2 feet gauge; the Mount Union of 2 feet 3½ inches gauge; the Pittsburgh and Castle Shannon of 3 feet 4 inches gauge; the Brownsville and Rio Grande and others of 3 feet 6 inches gauge.

A Curious Patent. — One of the great troubles which oystermen have to contend with is the starfish. This rapacious enemy destroys thousands of bushels of oysters every year, and no device has heretofore proved effective as a protection. But the ingenuity of a Connecticut Yankee has at last triumphed. Mr. Oliver Cook, of Darien, Conn., has lately obtained a patent on the subject. His invention consists in spreading a net under water, on the ground composing the oyster-bed. Mr. Starfish puckers his fingers together, squeezes himself up through the meshes of the net, and then extends his digits again. Being now upon the upper side of the net, he will be infallibly captured whenever the oysterman raises the net to the surface. This is to be frequently done until the enemy is cleared from the coast, when the oysters at once begin to laugh and grow fat.

An Electro-Capillary Motor. — A curious capillary experiment was devised by M. Lippmann some months since, which the author has recently utilized in a very ingenious way. The original experiment is thus described in the *Journal of the Franklin Institute:* Place in a saucer or in a large watch-glass a globule of mercury an inch or two in diameter, and pour upon it a little water acidulated with sulphuric acid and slightly colored with potassium bichromate. If now the mercury be touched laterally with the point of a needle, the globule will be observed to contract and withdraw itself from the needle, then to extend again to its primitive position. This brings it again into contact with the needle, the contraction is renewed, and so on indefinitely. When the globule is quite large it executes contorted and grotesque movements, which are surprising to those who are not in the secret. The explanation of this phenomenon is found in the fact that under the joint influence of the iron and the bichromate the mercury is successively oxidized and deoxidized, thereby producing an alteration in its capillary condition, and causing the swelling and flattening. This oxidation and deoxidation may also be effected by an electric current. The globule is seen to swell up or to flatten, according as it is connected with the negative and deoxidizing or with the positive and oxidizing electrode. It is this oscillating motion of the globule of mercury that M. Lippmann has utilized in his motor, which is constructed as follows: In a trough of glass two small cups are placed, full of mercury; in each of these moves a piston formed of a bundle of glass tubes. The trough is filled with acidulated water, and the two masses of mercury are in communication with the electrodes of a battery in such a way that when the one contracts the other flattens. Consequently, when one of the pistons rises, the other falls; and by simply transforming this reciprocating motion of the pistons into a rotary one, an electro-capillary engine of some hundredths of a kilogrammetre of power is readily obtained. In the machine actually constructed by M. Lippmann the fly-wheel made a hundred revolutions per minute.

A Remarkable Cabinet. — In the Museum of the St. Petersburg Academy of Sciences there is a very interesting cabinet, which was presented by the Empress Catherine. On opening it there appears in front a beautiful group of bronze bas-reliefs, which, by the slightest pressure on a spring, vanish, giving place to a magnificent writing-flat, inlaid with gems. The space above this flat is devoted to the keeping of valuable papers, or money. The bold hand that should dare to venture to this spot would immediately be its own betrayer; for at the least touch of the table part, the most charming strains of soft and plaintive music are instantly heard. The organ producing this music occupies the lower back part of the cabinet. Several small drawers for holding writing materials start forward on the pressure of their springs, and shut as quickly, leaving behind no trace of their existence. If one would change the table part of the cabinet into a reading-desk, a touch brings from the upper part a board, from which, with incredible velocity, all the parts of a commodious and well-contrived reading-desk expand, and take their proper places. But the mechanism of this work of art, as well as its outward appearance, should be seen, as nothing can be more difficult to describe. The inventor offered this rare and astonishing piece of furniture to the Empress Catherine II. for twenty thousand roubles; but she, generously thinking that such a sum would be barely sufficient to pay for the workmanship, recompensed his talents with a further present of five thousand roubles.

A Big Casting. — At the works of the Cockerill company, at Seraing in Belgium, a few weeks ago, a casting was made for the foundation of the anvil of a steam-hammer of twenty tons. This casting measures at the base 4 metres (of 39.37 inches each) by 2.8 metres, the height is 2.5 metres, and the upper side, on which the anvil is to rest, is 1.6 metres square. The weight is 176 tons (of 2240 pounds). The casting was made upside down, and is provided with trunnions, that it may be turned over and take its place on the foundation prepared for it. The forges being more than 700 yards from the foundry, the molten iron had to be carried by six tons at a time on a truck drawn by a small locomotive, the loads arriving at about fifteen to twenty minutes intervals. The running commenced at four in the morning, and was completed at five in the evening, and was effected without any extraordinary excitement.

COLORED INKS.

The following recipes have been well tested and are commended by good authorities as preferable to the solutions of aniline dyes which are now so extensively used as colored inks: —

Green. Two parts acetate of copper, one part carbonate of potash, and eight parts water. Boil till half is evaporated, and filter.

Blue. Three parts Prussian blue, one part oxalic acid, and thirty parts of water. When dissolved, add one part of gum-arabic.

Yellow. One part fine orpiment, well rubbed up with four parts thick gum-water.

Red. With the aid of a gentle heat, dissolve four grains of carmine in one ounce of aqua ammonia, and add six grains of gum-arabic.

Gold. Rub gold leaf, such as is used by bookbinders, with honey, till it forms a uniform mixture. When the honey has been washed out with water, the gold powder will settle at the bottom, and must be mixed with gum-water in sufficient quantity.

Silver. Silver-leaf treated in precisely the same manner gives a silver ink. Both these inks may, when dry, be polished with ivory.

Black. Three ounces crushed gall-nuts, two ounces crystallized sulphate of iron, two ounces gum-arabic, and twenty-four ounces water.

White. Fine French zinc-white, or white-lead, rubbed up with gum-water to the proper consistency.

PRACTICAL RECIPES.

Varnishing Paper Diagrams and Maps. — The first and most essential operation is the proper sizing of the paper, as, if this be imperfectly done, almost any kind of varnish will penetrate the paper so as to make oil-spots. Glue-water of the proper consistency is the best protective against the absorption of the varnish. It should be of the right strength, however. If, after being dried, it cracks in bending a corner of the paper, it was not diluted enough. When dry, the map is varnished with a solution of mastic, sandarac, or some other colorless resin in turpentine or alcohol, or a mixture of both; experience shows the best consistency in order to lay it on evenly with a brush. In cold weather it requires more of the solvent.

Improved Red Fire. — Ordinary red Bengal fire is usually a mixture of strontium nitrate, potassium chlorate, and sulphur. This mixture takes fire very easily, especially if damp nitrate has been used in making it, or if flowers of sulphur have been used instead of roll sulphur. M. Böttger recommends the following as a mixture which keeps well and does not take fire spontaneously: One part of shell-lac and four parts of very dry nitrate of strontium. The best way of making the mixture is to reduce the lac to coarse powder, and then half fuse it with the strontium salt. When cool, a mass is obtained which can easily be reduced to very fine powder.

Agriculture.

THE AUTUMN FAIRS.

Of how much real benefit to practical agriculture have been the numerous cattle-shows and fairs held the present autumn in all sections of the country? This is a question which cannot be very clearly settled in the mind of any inquirer, as it is impossible to know precisely how each has been conducted by the various managers. It is safe to say that a large number of these fairs, alleged to be for the benefit of farmers, have not been conducted so as to aid husbandry in any satisfactory manner. The politicians, the horse-jockeys, and noisy declaimers have had everything their own way at more than one of the farmers' gatherings in New England, and doubtless the same may be said of those held in other States, for these men are ubiquitous and turn up everywhere. Presumably these annual fairs are for the benefit of farmers and those interested in agricultural pursuits, and therefore whatever is said or done should have some bearing upon the industry which they are intended to aid and benefit. So far as is possible they should be under the management of those directly interested in husbandry, and opportunity afforded, if public speaking is allowed, for an interchange of views among this class. Agricultural fairs are no places at which to erect political rostrums or pulpits, and it would be well if the bellowing of bulls, the bleating of sheep, and the barking of dogs could be made to unite in one avalanche of sound sufficient to drown the vapid declamation of those who have no knowledge of or interest in agriculture.

Outside of all improper interferences at fairs, there is usually something to interest farmers, and they can hardly fail to obtain some new ideas at even badly-managed gatherings. The real benefit of fairs comes from the conversations and discussions among farmers around the cattle pens, in committees, in the exposition hall, where are displayed the products of the farm. If there is interest enough felt in them to induce farmers to attend, they can in their own society, independent of schemers or intriguers, compare notes, ask questions, examine farm and dairy products, etc., and thus gain some information of value. Beside this, fairs break in upon the monotony of daily labor; they afford opportunity for the mind to switch off upon a new track of thought; they serve to rub off some of the rust which will accumulate when there is no attrition of mind upon mind. Opportunity is afforded also for wives and children to visit the village or market town, and learn the fashions, and see the crowd. The boys fill their pockets with peanuts and gingerbread, the girls buy ribbons and cheap laces, the mothers fall in love with some new patented churn or washing-machine and purchase the same, and so all return home happier, if not better, for having attended the autumn fair.

CURIOUS APPLES.

Doubts are entertained by some pomologists as regards the truth of the statement made that apples have been grown in which two or more varieties were blended into one; that is, apples having one section sweet and the other sour. We have seen such fruit and therefore know that it has been produced. A tree bearing apples of

this nature formerly stood in a gentleman's garden in Georgetown, Mass. It was of large size and in some years produced several bushels of fruit. The owner sold the apples as curiosities, and frequently individual specimens brought large prices. It was exceedingly interesting to examine the crop, as one apple differed widely from another, and there was difficulty in finding two precisely alike. A few were found in which almost exactly one half was sweet and the opposite sour, but a majority were made up differently. Sections, one quarter or one sixteenth, more or less, would be sweet, or sour, and the remainder would be of the opposite kind. The line of demarcation on the skin was distinctly defined, the sour portion having a reddish color, while the sweet was of a pale green. There was no mistaking the flavor; the sour portion was very sour, and the sweet very sweet. On the same tree, apples grew which were uniform in kind, some being entirely sweet and others entirely sour.

This pomological freak was brought about by a careful process of budding, two buds of different varieties being divided, and one half of each joined together so as to adhere, and grow in that condition. As none of this fruit has been seen of late years, we conclude the tree has perished. The abundant apple crop in this section the present year has afforded some curious instances of abnormal growths. The crowding of young fruit on the twigs has caused in some instances three or more specimens to grow together and assume fantastic forms, and in one instance it was observed that a large and vigorous apple had so far outstripped its interfering neighbor, as to grow completely over and cover it, producing the singular spectacle of an apple within an apple, and both apparently thrifty. In walking through our orchards one morning, we were startled by observing upon the trunk of an old russet tree a little projecting twig borne down with the weight of two good sized, high-colored Baldwins. The puzzle was explained by supposing the original tree to have been of the Baldwin variety, and changed into the russet by early grafting.

WALKS AND CARRIAGE WAYS.

Dr. E. R. Bell, of Ripley, Ohio, sends us a note in which he says: "You kindly told your readers in the September number of the Journal, how to make lawns; will you please tell us how to make the walks and carriage drives?"

In constructing foot-paths and drive-ways around dwellings in the country, the nature of the soil and the resources of the owners are to be considered. If the land is damp and retentive of moisture, it will be found impossible to have satisfactory ways without thorough drainage; if, on the other hand it be of a dry silicious formation, very good paths can be constructed without interfering with the subsoil. In this section, it is always best to remove the mould, or upper soil, and fill in with small stones or pebbles so as to form a bed through which surface drainage may be secured. We have plenty of clay and gravel, and when the soil is wet, after depositing the covering of small stones in the road way, another covering of coarse gravel is used, and over this a thin surface sprinkling of sand. If the land is dry, a coating of clay is used, and when moist, it is covered with coarse gravel which sinks into it and forms a hard, durable walk or road way. Near the sea-coast where light, fine sand prevails, it is quite impossible to secure good roads without the use of concrete (a mixture of tar and pebble stones); and this is largely employed at Martha's Vineyard and other sea-coast resorts. Concrete, if properly prepared, forms most excellent and durable drive-ways and walks, and although considerably expensive, is not beyond the reach of most house owners. We have used it as a covering for mortar walls, in place of granite, and if not as elegant, it is equally protective to masonry, and very much cheaper. In constructing drive-ways it is far better to incur some expense, and have them well made, rather than to leave them in a slovenly condition, so that the family and callers are obliged to wade through water and mud to reach the dwelling. Nothing connected with our homes contributes more to personal comfort, or attracts wider notice, than elegant, dry, well-constructed paths and drive-ways, and we hope they will receive more attention in the future than they have in the past.

ABSORPTION OF GASEOUS AMMONIA BY PLANTS.

In an article on "The Absorptive Power of Plants" in the Journal for June, 1874, we referred incidentally to the experiments of Professor Mayer, of Wiesbaden, upon the capacity of plants to absorb gaseous ammonia from the atmosphere. In response to several inquiries we give a fuller account of these experiments, drawn from an article on the subject in the London *Agricultural Gazette*.

The plants experimented on were grown after the method of water-culture, which the Germans have carried to such perfection. The roots were in this manner supplied with cinereal plant food, but all nitrogen was withheld. Some of the plants grew in ordinary air, others in glass shades to which ammonia gas could be supplied, the stem of the plant in this case passing through a caoutchouc stopper, so that the ammoniacal atmosphere was shut out from the roots. Small cabbage plants and peas were experimented on. The following tables show the average results obtained: —

Experiments with Cabbage Plants.

	Dry substance.	Nitrogen.
Original plant.....	.364 gram.	.0115 gram.
Plant grown in air.....	.736 "	.0132 "
Plant grown in ammonia	1.326 "	.0310 "

Experiments with Peas.

	Dry substance.	Nitrogen.
Original plant.....	.235 gram.	.0115 gram.
Plant grown in air.. ...	.241 "	.0152 "
Plant grown in ammonia	.560 "	.0221 "

We see that the plants grown in ordinary air increased to a very slight extent in their amount of nitrogen, and as a natural result of their failure to acquire this essential element of plant food the total increase of the plant was in each case very small. Where ammonia gas was supplied artificially to the atmosphere, the plants increased much more both in nitrogen and in total substance, but the amount of growth even in dry substance resulting from ammonia furnished under these circumstances was small. Further experiments with wheat are recorded, in which the upper part of the plant was regularly painted with a weak solution of ammonia. The increased application of ammonia did not, however, produce better results than in the preceding experiments. Professor Mayer concludes from his researches that nitrogen must be applied to the roots of plants if a normal growth is to be obtained, but that a small quantity of ammonia may be taken up by the leaves. When we recollect how excessively dilute is the supply of ammonia existing in our atmosphere, we may well doubt if the amount absorbed by the leaves of growing crops is of any considerable importance. It also appears that a leguminous plant does not excel the cruciferæ or graminæ in their power of appropriating atmospheric ammonia; no light is thus thrown on the vexed question of the nutrition of the highly nitrogenous leguminosæ.

Professor Mayer's results do not materially differ from those previously obtained by Sachs and Peters. They succeeded in growing a bean plant in an atmosphere containing ammonia, the apparatus being so contrived that no ammonia could come in contact with the soil. The bean thus treated exhibited more growth than one not so supplied with gaseous ammonia, and on analysis it was found to contain about twice as much nitrogen as the other; the growth, even with the aid of atmospheric ammonia, was, however, very small.

THE GULF REGION AS A FIELD FOR EMIGRATION.

The *American Patron*, an Ohio journal, having addressed a series of inquiries to intelligent parties residing in different parts of the Gulf Coast, in regard to the eligibility of that section as a field for Northern immigration, received an official reply from Citronelle Council No. 7, Order of Progressive Farmers, Mobile County, Alabama, to the following effect: —

1. The salubrity of the Gulf Coast, east of Louisiana, is fully equal to that of any section of the Union. Miasmatic diseases prevail during certain seasons on the river-bottoms, but of a less malignant type than is found in similar localities of the North. The yellow fever is expected in the cities about every five years, but it never troubles the rural districts. The whole region is almost totally exempt from Asiatic cholera.

2. The climate of the South is destitute of the extremes of both heat and cold found in the North. A summer temperature of 90° F. is unusual, while the Gulf breezes render the air very delightful.

3. Most of the crops grown in the North can be successfully grown on the coast, with a great variety of tropical and semi-tropical products, giving scope for an exceedingly varied culture. An acre of corn there represents a greater money value than at the North.

4. Markets are fair and constantly improving. An increased production would call forth increased facilities for transportation. The early spring products are shipped North at a period when they find no competition.

5. Southern pine lands are worth more per acre than the best uplands of the Northwest. In the South an immense area of wild lands of the best quality, belonging to the Government, is open to homestead settlers. For improved lands $4 per acre is a high average price. The peculiar advantage of Southern products enables the judicious cultivator to realize a much larger value per acre than at the North.

6. The surface of the country is generally high, but rolling and well watered. Abundance of water-power is found in the streams. The swamp area, contrary to general impression, is very small.

7. Educational facilities are very good in the cities, and becoming more extended in the country. Church privileges are very good.

8. People from the North who come to engage in regular business and to identify themselves with the country will be kindly received.

RESPIRATION AND NUTRITION IN PLANTS. — M. Corenwinder has contributed to a recent meeting of the Société des Sciences, of Lille, an exhaustive series of observations on the processes of respiration and nutrition in plants. He supports M. Claude Bernard's view, that the process ordinarily known as the respiration of plants — the decomposition of the carbonic acid of the atmosphere — is really a process of digestion, and that simultaneously with this, plants carry on, by day as well as by night, a true process of respiration, similar in all respects to that performed by animals, consisting in an oxidation of the carbonaceous matters of their tissues. By a very careful series of analyses, performed mainly on the lilac and maple, M. Corenwinder determined that the proportion of nitrogenous matter in the leaves gradually and progressively diminishes from the time that they emerge from the bud till their fall; the proportion of carbonaceous matter increases very rapidly during April and May, and then remains nearly stationary till October; while that of incombustible substance increases during the whole period of vegetation. He distinguishes, therefore, two periods in the vegetative season of the plant — the first period, when nitrogenous constituents predominate, is that during which respiration is the most active; the second, when the proportion of carbonaceous substance is relatively larger, is the period when respiration is comparatively feeble, the carbonic acid evolved being again almost entirely taken up by the chlorophyll, decomposed, and the carbon fixed in the true process of digestion.

OLEANDERS AS WINDOW PLANTS. — On this subject *The Garden* remarks: "Visitors to Paris must have noticed the profuse manner in which this plant is cultivated for the decoration of windows, balconies, and the fronts of places of public resort. It is readily propagated from cuttings of the last year's wood, which can either be inserted in sand round the rim of the pot, or they will root freely in water. After the cuttings are rooted, pot them off carefully in a compost of sandy loam and leaf-mould, using small pots. The newly-potted plants may now be placed on a shelf in the greenhouse, near the light, and must be liberally supplied with water at the root. When the pots become full of roots, set them in pans of water, adding a little liquid-manure occasionally to strengthen their growth. Cuttings struck in the summer make nice little flowering plants in a couple of years, and go on blooming every season afterwards. Where the older plants are set outside during the summer months, select the hottest corner for them, where full exposure to the sun will ripen their growth thoroughly for next year's bloom. It is no use expecting this or any other hard-wooded plant to flower well, unless thoroughly ripened in the autumn. When the old plants get too large or leggy, they may be cut back, and will soon throw out young wood, and form bushy specimens. The bright, rosy, sweet-scented flowers are well adapted for cutting, although their odor is by some considered rather too powerful; still, if the apartment is well ventilated, a moderate supply of them may be agreeable."

WISCONSIN boasts of 4000 lbs. of grapes to a quarter of an acre.

Boston Journal of Chemistry.

JAS. R. NICHOLS, M. D., *Editor.*
WM. J. ROLFE, A. M., *Associate Editor.*

BOSTON, NOVEMBER 1, 1874.

PUBLISHERS' NOTICE.

UNDER the new postal law which goes into effect January 1st, 1875, the postage on the JOURNAL will have to be prepaid by the publishers. We shall not require our friends to remit the amount of the postage in addition to the regular subscription price, as most of our contemporaries have announced their intention of doing, but shall send the paper, *postpaid*, at the old rate of *one dollar a year*. This is virtually reducing the price twelve cents, or about *one eighth* of the whole amount. The JOURNAL has always been the cheapest periodical of its class in the country, if not in the world, and in making it yet cheaper we count upon a large increase in the number of its patrons, and also upon a prompt payment of all subscriptions due.

We would call particular attention to our revised "Clubbing List" in another column. Many of the periodicals on the list have raised their rates in anticipation of the requirements of the new postal law, but as the postage will in all cases be prepaid by the publishers, the cost to subscribers will really be no greater than before. In fact, *with the* JOURNAL they will cost less than before, on account of the reduction in our own rates to which we have referred above.

HOW DID LIFE FIRST COME UPON THE EARTH?

THIS is a very interesting question, and notwithstanding it is probable that no accurate or precise answer can, or ever will be given to the inquiry, it must continue to excite investigation and create controversy so long as human life exists. Professor Tyndall's address at the Belfast meeting of the British Association in August has awakened a vast amount of discussion in all parts of the civilized world, and the views expressed are regarded as new by a majority of writers and speakers. They however are not new; Professor Tyndall has been a "materialist" for many years. In an essay on the "Scientific Use of the Imagination," published in 1870, he says, "Life was potentially present in matter when in the nebulous form, and was unfolded from it by way of natural development." He expresses in this essay the belief that matter is endowed with a certain "creative energy," and that when the earth was fitted to become the theatre of life, this creative energy was roused into action, and from inert matter life came. This is the hypothesis of the origin of life as put forth by Tyndall, and only differs from that of Spencer, Huxley, Thompson, and others, in the use of a different form of words expressing the same thing. Sir William Thompson in 1871, occupying the same position as Tyndall, (President of the British Association for that year), in his address, after remarking upon the condition of the earth when no life could exist upon it, and subsequently when, though fit for life, none was there, says, "we must not invoke an abnormal act of creative power" if we can find any other "*probable* solution, consistent with the ordinary course of nature." In other words, he tells us we must not attribute the origin of life to any special act of a Creator, if we can find any solution of the great problem, in the evolutions and changes of matter, respectable enough to be regarded as "probable." We desire to say just here that thus far the researches of scientific men have not reached that point. No facts have been established, no investigations have penetrated deep enough into the unlighted field of inquiry which comprehends the genesis of life, to render any theory probable, based on the evolution of that mysterious principle from dead inorganic matter. In Sir William's address alluded to above, occur some passages which show in a most striking manner the ludicrous shifts and hypotheses to which even learned men will resort to sustain views which have no substantial basis to rest upon. To account for the presence of life upon the earth, from causes outside of any special act of a Creator, he supposes it possible that "countless seed-bearing meteoric stones, moving through space and carrying seed and living plants and animals," may have brought life here. For the president of a body of men embracing the solid ability and learning of England to venture upon the expression of such fantastic and absurd notions as these, is indicative of a weakness not well calculated to inspire confidence in scientific statements in the popular mind. The same evidence of weakness is noticed in some passages in Tyndall's address, and serves to remind us of one patent fact, which it is well not to forget, — that great men are usually only great in some one special department of study. In some branches of physical science, or in matters concerning the laws which govern the imponderable forces, Tyndall could hardly betray weakness, for in those directions his patient researches have rendered him strong. But when he steps outside, and ventures upon hypotheses concerning phenomena which from their nature are incomprehensible, then his deductions and reasonings fall to a level with those of very common men.

A grave mistake is made by many, in not rightly estimating the value of the views and opinions presented by those who deservedly stand high as scientific investigators. Because a student has worked out some new and extraordinary facts regarding the nature or effects of light, heat, or electricity, it does not necessarily follow that he is competent to discuss difficult points in the astronomical, chemical, or geological departments of science. Men usually become famous for some special work, or some special discovery, and it often happens that their ignorance or weakness descends to puerility when they attempt to discuss subjects even closely related to those upon which their fame rests. We cherish, as does all the world, a profound respect for Tyndall as a scientific investigator, but this does not spring from any light which he has shed upon the question regarding the origin of life. Upon that question no one can speak decisively, and if hypotheses are ventured upon, they had better come from the naturalists and microscopists, who have spent their lives in those fields of investigation.

One of the extraordinary features of Professor Tyndall's address is the exaggerated importance he assigns to the theories of the Pagan philosophers. Democritus, Aristotle, Celsus, Hippocrates, Plato, Pythagoras, and other sages of the

ancient world, were certainly great men, and we are willing to admit that they paved the way to some extent for the present progress of the human race in material power; but groping along as they did in the thick darkness of the ancient superstitions, their speculations concerning matter and the origin of life are vague and unsatisfactory. Science, properly so called, is of comparatively recent origin, dating back only to the introduction of the inductive philosophy advocated by Bacon, and subsequently adopted throughout the civilized world. It is therefore not much more than two hundred and fifty years old. It may perhaps be safely asserted that the speculations of the ancient sages regarding the unknown or the unknowable were as worthy of attention as those of our modern philosophers, but it is hardly worth while to bring them to the front in this age, when all we know of science, of any value, rests or should rest upon demonstration.

What is known of the origin of life, so far as science informs us, is due to the microscope, and this marvellous instrument leaves us a great distance from the boundary line between the finite and the infinite. In the study of matter, it brings us down to the simple round cell holding within itself a combination of forces which, when considered as a whole, constitutes life. From whence it comes, or what is its nature, the microscope affords no information. Geologically considered, the origin of life can be traced back no further than the *Eozoön Canadense*, a calcareous fossil, recently found in the Laurentian strata of rocks, which rocks are of primitive formation. If we assume that the *Eozoön* was the first living creature on this earth, we are still in the dark as regards the source of that life. If the little point of animated matter, protected by its calcareous shell, was evolved from the rock-dust of the ancient world, by means of potential agencies contained in that dead dust, we can see no reason why life should not spring from the same sources in these later days. But it does not and cannot. If we trace life onwards from the *Eozoön*, so far as geological records enable us to go, we think that the succes ive strata of rocks afford evidence of a gradually ascending series of animals up to almost the highest vertebrata. The chain of life up through the rocks, ending with man, is by no means perfect. There are many missing links which may never be found, but if it should be proved by future investigations that man is linked with the *Eozoön* at the other end of the chain, it need not distress us overmuch, or destroy our faith in an Infinite Mind which first called the *Eozoön* into existence. We may push a Creator as far off as the imagination can go, or crowd him out of the universe altogether; he still exists, and from him, and him alone, came life. None of the speculations of materialists, if proven to be true, affect man's present dignity, or his responsibilities to a living, personal God. Man's origin, even if he has descended primarily from the *Eozoön* or marine ascidian, is no more degraded than that presented in the Mosaic account, for we are there told that he was formed out of the dust of the ground. If the view of the materialists be correct, that the primary forms of life came from the dust, and man from those forms, his origin is the same, although the method of creation may be radically different.

WATER-PIPES.

Four years ago we prepared a series of articles for the Journal, upon pipes for conducting water to dwellings, their safety, durability, cheapness, etc., being fully considered. The conclusion reached at that time was, that a perfectly satisfactory water-pipe was much needed, as none of those provided by inventors and manufacturers were entirely unobjectionable. Lead pipes were dangerous, and so were the zinc-covered, or "galvanized" iron pipes; brass, gutta percha, glass, etc., were wanting in several important requisites, and common iron rested under the sole objection that it was liable to rust and fill up.

Since the articles were written attempts have been made to overcome the tendency to oxidation in iron water-pipes, and it is gratifying to know that success has apparently crowned these efforts. It has been found that rubber, when vulcanized and applied to iron heated to the right temperature, forms a permanent and perfectly insoluble coating, capable of protecting the iron from the action of water. In itself the coating is perfectly harmless, and does not under any circumstances contaminate the water. Two years ago specimens of this rubber-coated pipe were sent to us for examination and trial by Messrs. Morris, Tasker, & Co., of this city, and the results of experiments have been quite satisfactory. The coating is not sensibly affected by weak acids or alkalies, and no agent but free chlorine produced any marked effects upon it. As this gas is not usually present in spring, river, or pond water, no trouble can arise from it. These specimens of coated pipe buried in the earth for two years, prove to remain unchanged. The cost of the pipe is but little more than naked iron, and this is an important consideration.

PROGRESS IN THE ARTS.

One of the most modest, yet the most efficient and practical organizations in this city is the Massachusetts Mechanics' Charitable Association. It holds an exposition or fair once in three or five years, and everything is so quietly conducted that the exhibition is usually arranged and open before half the people of the city are aware of the intentions of the managers. This year the exhibition was opened in September, and continued until the 17th of October. The rooms in which it was held comprised Faneuil Hall, and the long hall over Quincy Market, with a temporary structure uniting the two; but these have proved wholly inadequate to meet the wants of exhibitors, and before another show is held, the association must provide buildings of much larger dimensions, and better adapted for a great mechanical and art exhibition. The last exposition was remarkable in every respect, and we doubt if there were ever crowded into an equal space, so many wonderful inventions, so large a variety of magnificent machinery, so much that was new and interesting, since art exhibitions were inaugurated. We have visited a large number of these exhibitions in the different countries of Europe, and those established in the cities of our own country, and we have seen no industrial display more interesting, practical, or useful.

The impression produced upon examining the collection was, that great progress had been made in the mechanic arts since the last fair, five years ago. A large number of machines and processes which, as shown at that time, were quite imperfect, have been completed and perfected, the difficulties having been surmounted which stood in the way of entire success. The improvements in stoves, furnaces, and steam-heating apparatus were apparent to all visitors, and the same may be said of agricultural implements. The numerous lawn-mowers exhibited showed how much inventive skill had been expended in these convenient little implements. Five years ago there were but three or four patterns, now we are informed there are over forty. The devices for utilizing the light products resulting from the distillation of petroleum were numerous, and the difficulties and objections to "gasolene" apparatus are now satisfactorily removed. We hope manufacturers will cease calling their apparatus "*gas* machines," as they do not produce *gas*, but only a vapor, which is held mechanically by air. The numerous devices for storing and measuring "kerosene," and kindred products, proved how important these articles are in commerce. Progress, progress, in the mechanic arts, was apparent in all that the eye rested upon. In soaps, colors, paints, chemicals, vast improvements have been made in the half decade since the halls were last thrown open to the public, and in textile fabrics perfection seems almost to have been reached. The steam engines and heavy machinery moved without noise, and the whirling bands and wheels, with the busy attendants, gave an active appearance to the rooms in which they were exhibited. We shall anticipate the opening of the next fair of the Mechanics' Association with unusual interest.

THE NATIONALITY OF "OLD PROBABILITIES."

In the last number of the Journal, we gave an abstract of an interesting article by Professor Abbé in *Silliman's Journal*, in which he states his reasons for counting "Old Probabilities" as a Yankee by birth. This has drawn out the following communication from our esteemed *confrère*, Dr. P. H. Van der Weyde: —

An article on "The Origin of Weather Telegraphy," in your October number, states that Leverrier in France, in 1854, called attention to the importance of systematic weather reports, and that in 1863 a system of daily probabilities was inaugurated in that country; further, that Professor Redfield wrote in 1846 to *Silliman's Journal* that gales might be predicted with the help of the telegraph, and lastly that the Weather Bureau was inaugurated in the United States in 1865. These statements are undoubtedly correct, but as the article is intended as an argument concerning the honors of priority in this regard, it may be well to make a few statements of facts within my personal knowledge, the correctness of which I can prove by published documents.

Professor Buys Ballot, of Utrecht, Holland, after having for years made meteorological observations with a view to attain probabilities, established simultaneous observations at fixed days and hours all over Holland and neighboring localities, with help of voluntary correspondents, of whom the subscriber was one.

Later the system was extended, and the established telegraph companies aided liberally in transmitting the weather reports, while Professor Buys Ballot urged, during a period of 14 years, the government of Holland to publish them officially, and to organize a weather bureau, which was finally done May 21st, 1860. England followed suit in

February, 1861; France in August, 1863; and the United States intended to do so in 1865, when the destruction of the Smithsonian Institution, which was to be the head-quarters of the enterprise, caused a postponement. These dates may be seen verified in the latest German edition of Müller's "Lehrbuch der Kosmischen Physik," page 628, a testimonial from a neutral third party, the Germans, known to be always scrupulously correct in dates and places, and surely not favorably inclined towards Holland.

We commend the above to the consideration of Professor Abbé, who, if he is in the wrong, will doubtless be prompt to acknowledge it. If "Old Probabilities" is after all a Dutchman, neither France nor the United States should dispute his paternity. Seven cities, we are told, claimed to be the birthplace of Homer, and it is impossible to determine which of them is entitled to the honor; but in this case a careful sifting of facts and dates will of course settle the question. When it *is* settled we shall be happy to announce the result.

☞ Mr. Charles S. Davis, of this city, having been admitted a partner in the house of Billings, Clapp, & Co., manufacturing chemists, and proprietors of the Journal, we take the liberty of saying that we have known Mr. Davis for many years, and that he brings to the new duties which he has assumed a large business experience, and a character for ability and integrity which but few possess. He will have charge, not only of the general business of the house in the city, but of the business department of the Journal. The large and rapidly increasing business of Messrs. Billings, Clapp, & Co., whose chemical products are known in all parts of the country, has made this change necessary.

EDITORIAL NOTES.

Sulphite of Lime for Cider. — An eminent preacher, in a recent address before an agricultural association, said that he did not advocate the making of cider, but if his hearers *would* make it he advised them to "make it *good*." If made good and *kept* good — that is, checked at the right point in the process of fermentation, and prevented from becoming "hard" and alcoholic — it is a beverage to which few, even of those who hold extreme views on the temperance question, will make serious objection; and there is no doubt that this desirable consummation may be effected by the judicious use of the neutral sulphite of lime. The experience of those who have tested it for this purpose during the past sixteen years is unequivocal upon this point. It is important, however, to remember that its only action is to *arrest* fermentation, not to counteract it after it has once taken place. No backward step is possible in this process of natural chemistry, any more than in that of decay, to which it is analogous. You may keep a ripe apple sound for months with proper care, but if it once begins to rot there is no restoring it to soundness again.

Some two years ago, one of our Western correspondents recommended the use of the sulphite for preserving fruits. His directions for the process, which we reprint for the benefit of those who care to try it, were as follows: "Use two teaspoonfuls of neutral sulphite of lime to one gallon of fruit, with the usual quantity of sugar. Put in the lime while the fruit is heating, in order that any impurities in fruit or sugar may rise to the top and be removed. Fruit thus prepared, put in jars, and stored in a cool place, will keep for months."

The Sum of Science. — The London *Globe* says: "Professor Tyndall's laborious address to the British Association may be readily summed up by the simple re-statement of a very old argument. An egg contains all the material necessary to form a chick. It holds also, for a time at least, the force requisite to construct the animal out of its component elements. The only thing needed is to set the formative process in action by the application of another form of force or motion called heat. But this last must be supplied from without. The sum of Professor Tyndall's researches is precisely analogous. He finds in matter 'the promise and potency of every form and quality of life,' just as the naturalist and the organic chemist find the organic materials of a chick, and the promise and potency to form one, within the egg-shell. But neither the philosopher nor the experimentalist can go one step beyond the facts. They are wholly unable to explain the something from without, in whose absence neither an eggful nor a world of life can be called into palpable existence. This is the point at which philosophy again arrives — the old point at which it has been arriving by various paths ever since the first effort to penetrate an inscrutable mystery. The Egyptians symbolized the difficulty, and their inability to surmount it, by offering the mysterious egg reverently to their gods. They laid the unsolved problem of the finite at the feet of the Infinite. Professor Tyndall and the British Association might learn wisdom, without humiliation, from the ancient idolaters, and emulate their not ignoble submission."

To Soften Hard Putty. — The following from a correspondent in Falls City, Pa., under date of July 25, 1874, is worth making a note of: "In your number for July you give a method of softening hardened putty by an application of caustic potassa. A plan I have used with great success is to apply a hot iron to the putty; the kitchen poker, bent at the end, answers as well as anything else. The iron should be heated to a cherry red, and applied a sufficient time to scorch the putty, after which the putty can be taken out, leaving the sash perfectly clean. With a reasonable amount of care the sash need not be scorched."

ATOMS.

Iron gives what it calls "the rather startling news" that Belgium is going to supply Leeds with a 350 horse-power steam-engine, and adds: "It behooves us to be stirring ourselves if we would not be ousted out of our hitherto impregnable position, in which we have fancied ourselves so secure, as the leaders of the engineering world." — An Irishman in Cork thinks that he has succeeded in squaring the circle, and offers to demonstrate the same "before any number of appointed scientific gentlemen!" — The Bessemer saloon steamer was successfully launched at Hull (England) on the 22d of September. — According to official reports, the average amount of water supplied daily to London during the month of August was 127,649,776 gallons. — A trial has been made at Breslau, before the National Science Congress, of Dr. Reclam's new cremation apparatus; in half an hour the soft parts of the body were thoroughly consumed, and within an hour the bones were reduced to white ashes. — The Governor of the Cape of Good Hope, at the recent opening of its Parliament, stated that the revenue of the colony was annually increasing, and that about 800 miles of railway would at once be built, at a cost of from twenty to twenty-five millions of dollars. — According to a French journal the fruit crop in Gascony this year is enormous: the vines, it says, are so loaded that the branches threaten to break down; peach, plum, apple, and pear trees have had to be propped up; peaches, weighing three to the pound, have been selling in the streets of Toulouse at 12 cents a dozen, fine grapes at 2 cents a pound, and the choicest plums at 2 or 3 cents a hundred. — The London *Agricultural Gazette*, in an article on the English crops says that "wheat has yielded so abundantly everywhere this year that it is now one of the cheapest foods in the market, cheaper probably than oats or barley, cheaper than Indian corn or oil-cake." — The managers of a new railway enterprise in England have adopted a plan for promoting the sale of their stock, and one which is said to be very successful; all shareholders whose investments amount to £100 ($500) or more are to have the privilege of travelling on any portion of the line in first-class carriages at third-class fares. — To make a penny go a great way, draw it out into 2700 feet of wire, as was lately done in Scotland. — At the late meeting of the American Medical Association, Dr. Bell, of Brooklyn, to show the unlimited time in which saturated alluvial soils retain deleterious influences, related an anecdote of the digging up of the mastodon at Cohoes, New York, some years ago, the effect of which was to make the workmen sick from the stench arising, notwithstanding the fact that it was but a young mammoth and had been buried only about 40,000 years. — A writer in the *Philadelphia Medical Times* states that he has, by way of experiment, eaten small quantities of the transparent jelly of the ordinary jelly-fish as raw oysters are eaten, and found it not unpalatable; and the *London Lancet* says that at a luncheon given by one of the directors of the Brighton Aquarium the *pièce de résistance* was boiled octopus, or "devil-fish," which was pronounced to be very palatable, resembling boiled lobster and skate." — Inquiries made at slaughter-houses in New York have brought out the fact that some two hundred persons in that city are in the habit of drinking blood warm from the ox for strengthening purposes and for the cure of diseases. — A medical friend of ours who has cured a very bad case of "fits" considers it an illustration of the Darwinian doctrine of "the survival of the *fittist*." — During the past ten years the screw has entirely replaced the paddle in transatlantic navigation, the weight of marine engines has diminished one half, the steam pressure has quadrupled, and the consumption of coal has decreased two thirds. — The scheme advocated by M. Lesseps for the construction in Algeria of an immense lake connected by a canal with the Mediterranean, has been challenged by M. Fuchs, at a meeting of the French Academy of Sciences; he asserts that the mountain passes, through which a canal is supposed to have formerly run, are very considerably above the level of the Mediterranean, and consist of a bed of calcareous rock; while the so-called basin is also much above the sea level. — According to the reports of the English Patent Office, more than 72 per cent. of the patents are allowed to lapse at the end of the third year, and 90 per cent. at the end of the seventh; that is, there are only 10 per cent. which, in the opinion of the inventors, are worth £100 ($500) at the expiration of seven year's trial, that being the cost of the extension of the patent. — Messrs. A. S. Barnes & Co. have just published *Peck's Complete Arithmetic*, which, with the little *Practical Arithmetic* recently issued, makes a remarkably compact and satisfactory series for school use. — The "Hints on the Selection of a Microscope," advertised by the publishers of *The Technologist*, are very sensible hints, and the "Excelsior" microscope, which they sell for $2.75, is the first instrument we have seen at any such low price that was really worth buying. — Mr. Conway's series of papers on "Decorative Art and Architecture in England," just begun in *Harper's Magazine*, promises to be of unusual interest. — Mr. R. B. Tolles, the eminent Boston optician, is now making to the order of Dr. B. A. Gould a five-inch equatorial telescope of 35-inch focus, for the observatory at Cordoba, Argentine Republic; it will be nearly a duplicate of the one owned and used by Dr. Gould for several

years. — *Every Saturday* has been merged in that good old standard magazine, *Littell's Living Age*. — It may not be generally known that J. R. Osgood & Co. have published two admirable heliotypes of the new Harvard Memorial Hall, from different points of view, which they sell at the low price of fifteen cents each. — The National Bureau of Education has issued a valuable "Circular of Information" on drawing in public schools and the present relation of art to education in the United States.

LITERARY NOTES.

The Appletons have published *Clinical Lectures on Diseases of the Nervous System*, by Prof. W. A. Hammond, reported, edited, and annotated by T. M. B. Cross, M. D. The reports are very full and the histories of the cases are added, forming a clinical volume, which, while it does not claim to be exhaustive, will nevertheless be found to illustrate the most important nervous affections commonly met with in practice.

Lindsay and Blakiston are already in the field with their *Physician's Visiting List for* 1875, a professional *vade mecum* which, after twenty-four annual editions, needs no commendation from us. A. Williams & Co. have it in all the various sizes.

A new revised edition of Prof. J. D. Dana's *Manual of Geology* has been lately issued by Ivison, Blakeman, Taylor, & Co., of New York. The book has been for the most part rewritten, and is greatly enlarged. It is the most complete treatise of geology published in this country, and gives a clear and comprehensive view of the present state of the science. One of the best features of the work, and one that specially adapts it to the use of American students, is the fact that its illustrations are largely drawn from this country. The publishers have given it a dress in full keeping with its standard character.

J. R. Osgood & Co. have published an excellent translation of *The Story of a House*, by Viollet-le-Duc, the most eminent of living French architects. Every step and process in the building of a house in the thorough French way is described, and woven into a pleasant household tale. The author's illustrations are well reproduced in heliotype, and the book is every way an attractive one. *The Building of a Brain*, by Dr. E. H. Clarke, may be viewed as a supplement to his "Sex in Education," treating more fully certain questions that were purposely omitted or very briefly touched in that now famous book, and it is likely to excite no less interest and controversy. *Little Classics, Vol. II.*, is entitled "Intellect," and contains among other things Bulwer's "The House and the Brain," Poe's "Fall of the House of Usher," Hawthorne's "Wakefield," and De Quincey's "Murder considered as one of the Fine Arts." *Choice Receipts* is a new cook-book, which is unique from the fact that all its formulas have been tested. It is a common fault of the culinary recipes found in books of this class that they seem to be "evolved from the writer's consciousness," and, though apparently faultless in the abstract, prove miserably unsatisfactory when brought to table in a concrete form; these, on the contrary, will bear the proverbial "proof of the pudding" without discredit. *The Schoolmaster's Trunk*, by Mrs. Diaz, is another capital little household book, discussing a variety of every-day topics with much good sense and humor.

Hurd and Houghton have issued the first number of their *United States Official Postal Guide*. It is not intended for postmasters, but for the general public who use the post-offices. The organization of the department, suggestions about the preparation of mail packages of all kinds, a statement of what is mailable matter, rates of postage, domestic and foreign, registration of letters, three separate lists differently arranged of the post-offices in the United States, a list of money-order offices, the sailing of foreign mail steamers, and other things of nearly equal importance, are included in the volume. It is handy, compact, accurate, well printed, and cheap. It may be found, with other new books, at Noyes, Holmes, & Co.'s.

The Universality of the Homœopathic Law of Cure, an essay by Charles Neidhard, M. D., will be found interesting reading even by those who do not accept the author's conclusions. He has brought together a large amount of curious and entertaining matter in illustration of his subject, and we do not wonder that the pamphlet has already reached a second edition. Boericke and Tafel are the publishers.

The American Medical Weekly is a new journal, edited and published at Louisville, Ky., by E. S. Gaillard, M. D., the editor of the "Richmond and Louisville Medical Journal." It furnishes twelve octavo pages of reading matter at the almost incredibly low price of *two dollars a year*, and the numbers already issued promise well for the success of the enterprise.

A new medical monthly is announced for the coming year, *The West Virginia Medical Student*, to be edited by James E. Reeves, M. D., and published at Wheeling, West Va., at two dollars a year. The editor is already favorably known by his Board of Health Reports and his contributions to various medical journals.

The fourth number of the pretty *Floral Guide for* 1874, published by James Vick, Rochester, N. Y., has been issued, and contains a good variety of floricultural matter appropriate to the season. The quarterly issue will be continued for 1875, at the same price of *twenty-five cents* for the year, and the postage will be prepaid.

Medicine and Pharmacy.

THE EUCALYPTUS GLOBULUS, OR "FEVER GUM TREE."

A great deal has been written of late about the *Eucalyptus globulus*, and the question of its sanitary and medicinal value has been warmly debated in scientific and professional circles. The most complete and trustworthy account of the tree, and of what is now known of its properties and uses, is contained in a lecture on the subject recently delivered by Professor Bentley before the Royal Botanic Society of England, the following extracts from which may interest the readers of the Journal: —

"The first and most important influence which this tree exerts, and that which has brought it more especially into notice, is its power of destroying the malarious agency which is supposed to cause fever in marshy districts; from which circumstance it has been called 'the fever-destroying tree.' It is in this respect commonly regarded as being serviceable in two ways: first, by the far-spreading roots of this gigantic tree acting like a sponge, as it were, and thus pumping up water and draining the ground; and secondly, by emitting odorous antiseptic emanations from its leaves. Probably the influence of the latter is but small; although I am by no means of the opinion entertained by some writers, that these emanations are without effect. I do not certainly believe, as has been recently stated, that the branches of a solitary eucalyptus tree can have had any effect in neutralizing the malarious influence of a district previously constantly infected by fever; but I do think that the foliage of groves of eucalyptus trees, by diffusing an agreeable, aromatic, camphoraceous, stimulating odor in the surrounding air, does have an appreciable influence in neutralizing marshy miasmas, and thus improving the healthiness of the district. . . .

"But whatever be the cause or causes which render a marshy district thus comparatively healthy to what it was before the introduction of the eucalyptus trees into the neighborhood, the fact is unquestionable, and is now testified to in various parts of the world. Thus at the Cape, in a very few years, the cultivation of the eucalyptus has completely changed the climatic condition of the unhealthy parts of that colony; and in Algeria, where it has been tried on a large scale in a district previously noted for its pestilental air and consequent prevalence of fever, not a single case now occurs, although the trees are not more than nine feet high; and in the neighborhood of Constantia it is also stated that at another noted fever-spot covered with marsh-water both in winter and summer, in five years the whole district was dried up by 14,000 of these trees, and the inhabitants now enjoy excellent health. In Cuba, again, marsh-diseases are fast disappearing from the unhealthy districts where this tree has been introduced. In the Department of the Var it is also said that a station-house situated at one end of a railway viaduct, so pestilential that the officials could not be kept there longer than a year, is now as healthy as any other place on the line, in consequence of the planting of a few eucalyptus trees. Numerous other instances might be cited to the same effect as having occurred in France, Spain, Italy, Germany, and other parts of the world; and we cannot doubt, therefore, that although the effects have been to some extent probably exaggerated, the statements are substantially correct, and that this tree does possess a most beneficial effect in neutralizing and improving the malarious influence of marshy districts. . . .

"The timber of many species of eucalyptus is remarkable for its solidity, hardness, and durability, and for its power of resisting the attacks of insects and the teredo, as also the influence of moisture. . . . Baron von Müller found that the ashes of these trees 'contained a larger proportion of potash than the elm or maple, which are the trees most esteemed for that purpose in America. The yield from the latter trees is estimated at ten per cent. of the ashes, while that from the eucalyptus is 21 per cent.' . . . The barks of many species are also used extensively for tanning. . . . A number of species also exude a very astringent substance, which, from its resemblance to the ordinary medicinal kino both in appearance and properties, is commonly designated as eucalyptus or Botany Bay kino. It is employed for the same medicinal purposes as our officinal kino, and also for tanning and dyeing. Another substance, called eucalyptus or Australian manna, is also yielded by several species. It occurs in small, rounded, opaque, whitish masses, with an agreeable sweet taste. It has a similar action to the ordinary manna, and contains somewhat similar constituents. . . . Another important product of the eucalypti is the essential oil. This oil is stored up in the pellucid glands contained in the leaves, and readily observed when these are held up to the light, by the semi-transparent appearance they then exhibit. The oil chiefly consists of a substance called by its discoverer, M. Cloez, *eucalyptol*, a liquid body, in chemical characters resembling camphor. From the quantity of oil contained in the leaves, they yield, when burned, a very large proportion of gas; and it is said that one of the towns in the gold-regions was for a long time lighted by gas extracted from this source. . . .

"The febrifugal properties of the bark and leaves of this plant have been testified to by many practitioners. Probably some of the exaggerated statements that have been made in reference to the efficacy of eucalyptus bark and leaves in fevers have arisen under the mistaken idea that the bark contained an alkaloid resembling, if not identical with, quinine, the well-known alkaloid of cinchona-barks. But Broughton, the government chemist of Ootacamund, upon careful examination of the bark and leaves, states that neither quinine nor the other alkaloids of cinchona-bark exist in the plant in any proportion. What properties the plant possesses would appear, therefore, so far as known at present, to be due essentially to the presence of eucalyptol, already noticed as the principal constituent of eucalyptus oil. From the testimony of numerous medical practitioners in various parts of the world where the plant has been introduced, and from its popular reputation in fevers in Australia and other countries, we can scarcely doubt that it does possess antiperiodic properties, although these are far less important than those of cinchona-bark.

"When, therefore, we regard the beauty of the different species of Eucalyptus, and the proved influence of *E. globulus* in improving the pestilential character of marshy districts, the genus must be regarded as one of the most important to man in the vegetable kingdom."

CARBOLIC ACID AS AN ANTISEPTIC AND DISINFECTANT.

In a paper on "The Prophylactic Treatment of Cholera," by Professor Leffert, of Breslau, which we find translated in the *London Medical Record*, the writer, commenting upon the agents of disinfection "in the order of efficiency," puts carbolic acid first as "the best and most potent." He proceeds to speak of it as follows: —

Carbolic acid, or phenylic acid, is the best antiseptic and antimycetic agent of all the well-known and thoroughly-tested means. Water which contains carbolic acid in the proportion of 2 per cent.

will destroy great quantities of protomycetic masses. The pure acid, unmixed with any of the numerous substances suggested, is by far the best and most to be recommended. It is comparatively costly, but is more reliable than any of the cheap disinfecting substances. Its permanent odor in houses and dwellings is disagreeable, but one soon becomes accustomed to it. For large accumulations of excreta, privy-vaults, etc., 200 to 250 grammes (the gramme is 15.4 grains) of the acid should be dissolved in 3 to 4 litres (the litre is 1.05 wine quarts) of water and poured in once a day, best with a watering-pot. For privies, 100 to 200 grammes suffice, for large night-stools 30 to 50 grammes a day, and for night-vessels during the disease, a few grammes from time to time. The floor of the room should be sprinkled every day with a 2 per cent. solution, to attack the germs floating in the air, and if the room be always moist the solution may be mixed with sawdust, which should not be made too wet, however, and then after strewing the floor the room should be swept out or cleaned up. The washing may also be sprinkled with the same solution before it is put into boiling water. . . .

Green vitriol, the sulphate of the oxide of iron, had at one time a great but only ephemeral reputation as a disinfectant. We have become convinced, however, that it is more potent in disguising bad odors than in energetically attacking the germination of parasites. Its oxidation of organic combinations does not lead to the destruction of injurious myceta. The more this agent has been used, the more have its combinations with carbolic acid, permanganate of potash, etc., increased, a proof that its universal antiseptic action has been more and more distrusted. . . .

Chloride of lime is one of the oldest but certainly not one of the best disinfecting agents, notwithstanding its continued officinal character. It destroys bad odors, but affects but little the germs and seed of parasites. Its odor, if developed in sufficient quantity, is only partially parasiticidal at most, is as unhealthy as disagreeable, and is even at times injurious. . . .

Carbolic acid is therefore the best means hitherto known for disinfection of the air, of excreta, sink-holes, and privies. The efficacy of sulphurous acid water remains still to be proven.

A NEW USE FOR CHLORAL HYDRATE.

In the *Philadelphia Medical Times* of October 3, 1874, we find the following interesting communication from W. Macpherson, M. D., of Philadelphia: —

I have been for some months past making a new use of chloral hydrate, namely, that of a preservative for hypodermic injection solutions, and so far have been satisfied with its reliability and safety.

Having experienced both the inconveniences of dissolving morphine or other alkaloid powders extemporaneously, and the vexing delays which will occur at night in waiting for the compounding of prescriptions, I feel that the annexed suggestion will assist those who wish to possess a *reliable* means at the *needed* moment, securing certainty and saving time.

My formula is: Take of hydrate of chloral, two grains; diluted acetic acid, two drops; distilled water, four drachms (fluid).

In this menstruum any *alkaloid* usually employed (or any other of the materia medica which may be liable to decomposition) may be dissolved or suspended in the proportion customary with each practitioner.

I have experimented with the alkaloids morphia, atropia, and strychnia, also bromide of potassium, and in varying proportions. The solutions have kept free from *visible* alteration for several weeks, and their effect after this time was as certain as when recently compounded. A slight musk-like odor is developed in a few days, but the clearness of the solution is in no wise impaired.

HYGIENIC AND PROFESSIONAL HINTS.

The Overworked Man of Business. — The London *Sanitary Record*, in an interesting article on "Overwork," gives the following graphic picture of the business man who is overtasking his powers; and if any reader of the Journal recognizes the symptoms as his own, let him be wise in time, and remit the strain on his nervous system before he breaks down under it: "Sooner or later he finds that his day's work has become an effort, a toil rather than a delight; the last hour has become a strain only maintained by determination; a sense of exhaustion and fatigue envelopes his closure of the day's work, and the last columns of figures have presented difficulties hitherto unknown, and the last pile of letters has seemed more trying than of yore. Anything new of an unwonted character, making special demands upon the higher faculties, becomes arduous and distasteful, revealing the fact that the higher powers are first commencing to give way, to announce their inability, while the more routine matters, which have almost become automatic, or even habitual, can still be effectively discharged. But in time even these lower processes are affected, and the last half-hour at the office is a distinct trial, and is followed by a sense of exhaustion. There is a certain amount of irritability combined with the sense of exhaustion, that irritability which is ever found along with the exhaustion of nerve matter; this irritation sometimes almost amounting to exaltation, marks the commencement of nervous exhaustion and failure. While work seems to become more irksome, the usual sources of pleasure no longer afford their wonted solace and satisfaction. There is a heightened susceptibility to any little trivial annoyance, domestic matters are felt more keenly, the dinner is not so satisfactory, the children are noisy; the more necessity for rest, and the more distinct the craving for comfort and quiet, the less seems forthcoming. There is an emotional exaltation which reveals the irritability of the exhausted nerve centres; the newspaper is stupid and uninteresting, the piano wants tuning, servants are deteriorating, children are less obedient, and wives less sympathizing than of yore. The mind is as sensitive as is the skin after a blister; the slightest touch produces pain."

How to Avoid Colds. — An editorial in the *British Medical Journal*, on catching cold, concludes thus: —

"The practical considerations which are the outcomes of this review of the pathology of colds are these: Never to wear wet clothes after active muscular exertion has ceased, but to change them at once; to meet the loss of the body heat by warm fluids and dry clothes; to avoid long sustained loss of heat which is not met by increased production of heat; to increase the tonicity of the vessels of the skin by cold baths, etc., so educating them to contract readily on exposure, by a partial adoption, indeed, of the 'hardening' plan; to avoid too warm and debilitating rooms and temperatures; to take especial care against too great loss of heat when the skin is glowing; and to prevent the inspiration of cold air by the mouth by some protecting agent, as a respirator. We can readily understand how a respirator should be an effective protection against winter bronchitis in those so disposed."

Decaying Leaves. — *The Sanitary Record*, of London, calls attention to the mischief which fallen leaves are capable of producing under certain circumstances, and especially on heavy lands. "The ground that is strewn with leaves becomes a nursery of morbid influences. The delightful odor that fallen leaves diffuse in woods suggests their harmlessness; but on the roads and walks, where the leaves are hourly crushed and the dropping rain helps to make a paste of them, they are, without doubt, pestiferous nuisances, which should be removed as quickly as possible by parochial authorities and private proprietors."

Microscopic Examination of Morbid Tissues. — The *British Medical Journal* gives the following useful hints on this subject: "Take a portion of nerve-tissue, about the size of a large pin's head, from a thoroughly defined locality, press it out gently under a covering-glass on a slide, remove the covering-glass, and apply to the mass left on the slide a drop of 'Judson's simple (aniline) magenta dye,' diluted with eight drops of water; with a needle, mix the dye and the nerve-matter carefully, and cover the preparation with a clean covering-glass, again gently pressing it out to such an extent that light can pass through it. On submitting a specimen thus prepared to the microscope, it will be found that the cells, the nuclei of the neuroglia, and the blood-vessels, are beautifully tinted a deep crimson color, leaving the other tissues almost unaffected. Morbid products are also well brought into view, either by their ready absorption of the dye, as in the case of amyloid bodies, or by their refusal to take on the tint, as in the case of colloid bodies. Hæmatoidin accepts the color all too readily, but the practised eye soon recognizes its appearance. Pigmentary degeneration of cells is well shown, nucleus and nucleolus being thoroughly demonstrated; the poles can also be traced for long distances."

Bone Felon. — The London *Lancet* suggests the following simple treatment: "As soon as the disease is felt, put directly over the spot a fly blister, about the size of your thumb-nail, and let it remain for six hours, at the expiration of which time, directly under the surface of the blister may be seen the felon, which can instantly be taken out with the point of a needle or a lancet."

Treatment of Erysipelas. — The *Medical Record* states that in the Brooklyn City Hospital the following has proved efficacious as a local application in erysipelas: Acetate of lead, carbonate of magnesia, camphor, each twenty grains, water one pint.

Perchloride of Iron in the Treatment of Hæmorrhoids. — A writer in the *Dublin Journal of Medical Science* states that, having under his care a severe case of "bleeding piles" where all former treatment, including applications of fuming nitric acid, had been of no avail, he concluded to try injections of perchloride of iron. For this purpose twenty minims of the ordinary tincture were injected into each mass by means of a hypodermic syringe. The injection caused less pain than the nitric acid, and one administration sufficed to remove the hæmorrhoids completely.

Application for Burns. — M. Lebigot, in the London *Lancet*, recommends the following mixture as having been very successful: Cape aloes, four ounces; water, ten ounces; alcohol (90°), three ounces. The ingredients are to be melted together in a china plate over a slow fire, allowed to cool, and then filtered; after which three more ounces of alcohol are to be added. It is then ready for use. A table-spoonful of the liquid mixed with a tea-spoonful of acetate of lead and twenty table-spoonfuls of water constitutes an excellent remedy. It is to be applied morning and evening on the burnt parts.

DIETETIC CURIOSITIES.

Food and Bone. — H. Weiske and E. Wildt, in the *Zeitschrift für Biologie*, report a series of investigations by them upon goats, which showed that although the withdrawal of lime or phosphoric acid

from the food of adult animals led to fatal consequences, yet it had little or no influence on the composition of the bones, and, in particular, did not make them more friable. The present series of researches were made with a view of determining whether any such influence was exerted on the bones of young animals. The animals selected on this occasion were Southdown lambs about ten weeks old. One of these was fed upon food poor in phosphoric acid, a second on food poor in lime, and a third on normal diet. After the lapse of fifty-five days, various bones were analyzed, and the general result was, that just as in adults, so in young animals, no remarkable change was produced in the composition of the several bones by the difference in the diet, or, in other words, that the composition of the bones is independent of the nature of the food. The bones were, however, stunted in their growth.

Cannibal Tastes. — In the anthropological section of the recent congress at Lille, reported in the *Revue Scientifique* of September 12, one of the subjects discussed at some length was the practice of anthropophagy. M. Broca thereupon made some remarks on the different nature of the flesh of different races. He said that the cannibals, perhaps fortunately for us, do not like the flesh of whites; they find it bitter and salt, whilst, notwithstanding the latter quality, it does not keep well. Their special dainty is the flesh of the negro, of which they like the flavor, and which becomes dry by keeping rather than decomposes by the natural process.

A Large Appetite. — A woman suffering from bulimia has lately died in Paris at the age of forty-three. She ate every day on an average about six pounds and a half of bread, and half a pound of meat. Bread formed her principal sustenance, of which she required about nine pounds to completely satisfy her appetite. The unfortunate creature earned about two shillings a day as a needle-woman, which, with a little income she possessed, was nearly all absorbed in providing food for her insatiable appetite.

SELECT FORMULÆ.

Simple Elixir. — In reply to various inquiries, we give the formula for simple elixir referred to in the article on "Cincho-Quinine" reprinted in our last number from the *Philadelphia Medical and Surgical Reporter*: —

Spirit of orange	½ fluid ounce.
Stronger alcohol	4 " ounces.
Cinnamon water	6 " "
Syrup	6 " "

Mix.

This is a turbid mixture. For many purposes it is not necessary to filter before using, but generally it should be clear, particularly when used for physicians' prescriptions, and in making some elixirs. Filtering paper pulp, made by beating scraps of chemically pure filtering paper in a mortar, in the proportion of sixty grains of paper to half a fluid ounce of water, added to sixteen fluid ounces of the elixir, agitated briskly for a few moments, and filtered, renders the elixir perfectly limpid. The paper is free from the chemical objections urged against carbonate of magnesium, chalk, etc., which are frequently used as clarifying agents.

The very pleasant taste and odor of this elixir, its freedom from color and chemical impurities commend it for general use as a medicating vehicle.

Red Elixir.— The following is sometimes preferred as a simple elixir on account of its fine color:

Simple elixir (as above)	16 fluid ounces.
Comp. tinct. of cochineal	½ " ounce.

Mix.

The compound tincture of cochineal is made by warming 120 grains of compound cochineal powder in two ounces of diluted alcohol, and filtering.

Glycerine Jelly. — The London *Chemist and Druggist* remarks: "Glycerine jelly is usually cold cream tinted with a little rose oil, and with some glycerine incorporated while it is warm. A more distinctive preparation is produced as follows: —

Transparent soap	1 oz. (by weight.)
Water	4 oz. " "
Glycerine	24 oz. " "

Dissolve the soap in the water by heat, adding an equal quantity of glycerine. When dissolved, and while still hot, add the remainder of the glycerine. When nearly cold, perfume according to choice, and pour into glass jars. This is a transparent jelly of a pale amber color."

Treatment of Pneumonia and Bronchitis by Carbolic Acid. — Mr. Henry Greenway states in the *British Medical Journal* that he has been treating uncomplicated pneumonia and bronchitis very successfully with carbolic acid. The following is his formula for an adult: —

Glycerini acidi carbolici	℥ij.
Extracti opii liquidi	♏ xxx.
Aquæ camphoræ	℥vj.

M. S. A table-spoonful every four or six hours in water.

Cincho-Quinine. — The following, which we copy from the "Transactions of the State Medical Society of New Jersey for 1874," is a portion of the Report of the Standing Committee: —

"Before closing this part of the report, the Committee notice the commendation by some of the reporters of the new alkaloid of Peruvian bark, known as Cincho-Quinine. Dr. Schumo, of Sussex, whose practice requires a large administration of bark, remarks that he now uses Cincho-Quinine to the entire exclusion of the sulphate of quinine, and finds that it answers fully as well; he is perfectly satisfied with the result of his three or four years' experience. He gives it in about the same dose. His plan of prescribing it is to mix it with finely-powdered gum guiac., thoroughly, in a mortar (one part of Cincho-Quinine with two of guiac.) mixing the powder with honey, which entirely conceals the taste. He also forms it into pills with molasses. The reporter for Morris [Dr. Mattison] employs it largely and with much satisfaction."

Dr. G. Ingalls, of Northampton, Mass., in a letter written August 1, 1874, remarks: —

"The Cincho-Quinine in my practice has given the best of results, being in my estimation far superior to the sulphate of quinine."

A. Templar, M. D., of Giddings, Lee County, Texas, writes thus, September 12, 1874: —

"I have yet to find a case where the Cincho-Quinine is not as beneficial as quiniæ sulph., and in fact far preferable; for ladies and children more especially, where there is any irritability of the stomach, as it does *not* nauseate. I have given it to many who told me they could not take quinine, and with the most happy effects."

Drs. D. S. and J. A. Wallace, of East Brady, Pa., under date of October 9, 1874, say: —

"We have used, we think, 125 ounces of Cincho-Quinine, and are pleased with it; in fact, it has almost if not quite displaced the sulphate of quinia from our store, except that we keep the latter to fill prescriptions of other physicians."

F. E. Harpel, M. D., of Danville, Montour County, Pa., writes as follows, under date of October 12, 1874: —

"I have tried the Cincho-Quinine in several cases of intermittent fever, and am very well satisfied with it. It has none of the bad effects that sulphate of quinia has upon the head, etc. I have given it in two cases to children in which the fever raged to such a height as to cause terrible pain in the head and delirium, which the Cincho-Quinine did not aggravate, but contrariwise removed it."

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On receipt of the publishers' price of any one of the following periodicals, we will send *both the* Journal *and that periodical* for one year: —

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Familiar Science.

SOLAR AND LUNAR ECLIPSES.

THE recent lunar eclipse has naturally awakened in the popular mind a new interest in celestial phenomena, and among the young much inquiry is heard regarding the cause and history of eclipses. It is observable also that there still remains among a certain class a feeling of awe and mystery regarding the phenomena, akin to that which prevailed in ancient times, and this, notwithstanding so much knowledge is diffused among the masses. It cannot, however, be said that this feeling to any extent trenches upon the domain of superstition, or that any serious apprehensions or fears prevail. The most ignorant in civilized communities know that eclipses are well understood, and that the time of their occurrence is accurately foretold. So stupendous are the facts, so bewildering the teachings of astronomical science, it is probable few of its statements and deductions would be believed did not eclipses take place precisely in accordance with prediction. These positive demonstrations of the accuracy of scientific research tend to silence all doubts and all cavil, and the astronomer is regarded by many as a being endowed with almost superhuman attributes. In the infant state of science among all nations eclipses seem to have been regarded as the indications of an offended deity, rather than as the result of the operation of the immutable laws of nature. It is indeed not strange that the sudden blotting out of the sun's light, without the least warning, should appall the ignorant and superstitious races of a former age. Unexplained by science, the phenomenon might well be regarded as the most awful and alarming that could possibly occur. The intercepting of the moon's light during an eclipse, although equally puzzling to ignorant minds, would not cause so intense alarm, and in fact would not be so generally observed.

An eclipse, in general terms, is caused by the interposition of an opaque body between a luminous object and the body, or part of the body, illuminated. The occasional passage of the moon between the sun and the earth produces a solar eclipse; and the falling of the moon into the earth's shadow causes a lunar eclipse. If we can credit the statements of Herodotus, the learned men of his time were able to calculate eclipses, for he informs us that Thales, the celebrated Grecian philosopher, predicted an eclipse of the sun, which put an end to the engagement between the Medes and Lydians, and induced the combatants to listen to propositions of peace. Two other eclipses are said to have been predicted by the ancient Greek astronomers, but it is not probable that these predictions were based on any exact knowledge of the motions of the heavenly bodies. It would indeed be interesting to know who was the first to solve the wonderful problem as to the cause of eclipses, and who was first to accurately predict them. The first recorded eclipses so far as known are those of the moon, and they were observed by the Chaldeans in the years 720 and 719 B. C. In the writings of the ancients, eclipses are usually associated with important undertakings, as the starting out of armies for conquest, the sailing of fleets, or the commencement of battles. The success of the Athenians under Pericles, August 3, 430 B. C., is stated to have been seriously threatened by a total eclipse of the sun. He manned a hundred and thirty ships and was preparing to set sail, in fact the whole fleet was in readiness and Pericles on board of his own galley, when the eclipse happened. The sudden darkness was looked upon as an unfavorable omen, and threw the army and sailors into the greatest confusion. Pericles, observing that the pilot was much astonished and perplexed, took his cloak, and having covered his eyes with it asked him if he found anything so terrible in that, or considered it a sad presage. Upon his answering in the negative, he said, "What is the difference, then, between this and the other, except that something bigger than my cloak causes the eclipse?" Although this may show that Pericles had some knowledge of the cause of the eclipse, no evidence appears that it had been predicted.

The accounts of the ancient Greek and Latin writers of eclipses which occurred in their times have been very carefully studied by astronomers, and a vast amount of labor has been expended in calculating *back*, to ascertain whether an eclipse might be possible at the times stated. It is found that there are serious discrepancies in dates, and but little satisfaction or aid to astronomical science has been afforded by these researches. Professor Airy has, however, been successful, by founding his calculations upon improved lunar tables, in proving that the celebrated eclipse known as that of Agathocles, mentioned by Diodorus Siculus, did actually occur at the time mentioned. In the accounts that have come down to us but few details of the attendant phenomena are given. In only one instance is the occurrence of the luminous ring or corona mentioned. This was in the year 95, and the eclipse was supposed to presage the death of the Roman emperor Domitian. Philostratus, in recording this event, says, "In the heavens there appeared a prodigy of this nature: a certain corona, resembling the Iris, surrounded the orb of the sun and obscured his light." This "certain corona," is the optical phenomenon to which the attention of modern observers has been most distinctly called in recent observations of total solar eclipses. Professor Young of Dartmouth, who has so often contributed to the pages of the JOURNAL, has greatly distinguished himself by his observations and researches upon the "corona" noticed by Philostratus eighteen hundred years ago.

Eclipses have ever been regarded as very important phenomena in the system of the world, since their accurate observation enables the astronomer to test the accuracy of his theory, and of his solar and lunar tables. They are very important also, and especially eclipses of the sun, for the determination of terrestrial longitude. Various methods have been devised for calculating eclipses. The plan of orthographic projection seems to have been the most popular, though it is not accurate, affording only a close approximation. Its convenience in actual calculation is however great, and where the utmost accuracy is not required it is largely used.

There have been but about a dozen total solar eclipses observed in England since the tenth century, and no one of these attracted the special attention of astronomers until 1706. During this eclipse the corona of light around the moon was observed, but no explanations were ventured upon. A writer states that during this eclipse "the bats flew about as at dusk, the planets Venus, Mercury, and Saturn appeared, the fowls and pigeons betook themselves to their resting-places, the little birds which sung in their cages were silent and put their heads under their wings, and animals which were at labor stood still." Large numbers of persons were seen prostrate on the ground, and offering up prayers under the impression that the last day had come. This was less than two hundred years ago, and if the progress of science had been arrested, there is reason to believe that the same scenes would be witnessed now, if a total solar eclipse should occur.

The importance which astronomers attach to the accurate observation of eclipses in these later times may be understood from the fact that Dr. J. Lamont has collected one hundred and thirteen memoirs relating to the eclipse of 1860, and it is probable that double that number might be collected, relating to that which took place in 1869. American astronomers occupy a distinguished position as accurate and ingenious observers, and the instruments which our opticians are able to produce do not suffer in comparison with those made by the most distinguished artists in Europe.

THE LORDS OF THE INSECT CREATION.

IT is an interesting question to which of the insect tribes we should assign the preëminence in respect to intelligence, or "instinct" that seems like intelligence. Shall we award the palm to the bees, those "singing masons, building roofs of gold," or to the wasps, whose *papier mâché* architecture is no less wonderful, or to the provident ant, from whose ways the sluggard is bidden to learn wisdom? On the whole we are disposed to agree with those who rank the ant as the wisest of insects. A recent French writer has argued that of all animals ants approach

nearest to man in their social economy; and Mr. Thomas Belt, in "The Naturalist in Nicaragua," adds that "perhaps, if we could learn their wonderful language, we should find that even in their mental condition they also rank next to humanity." Among the ants of Central America, whose habits he has observed with special care, he regards the *Eciton* as the first in intelligence, and as such at the head of the great family of the Articulata. Wasps and bees come next, and then others of the Hymenoptera. Between ants and the lower forms of insects he considers that there is a greater difference in reasoning powers than there is between man and the lowest of the Mammalia.

This view of the rank of the Hymenoptera among the Articulata and of the ants among the Hymenoptera is confirmed by the geological records, where the development and appearance of this order and of the Mammalia among the Vertebrates are curiously parallel. Both orders make their first appearance early in the secondary period, but it is not until the beginning of the tertiary epoch that ants and monkeys are found. The one order thus seems to culminate in the ants, as the other does in the primates.

Some of the instances of the intelligence of ants which Mr. Belt gives are exceedingly interesting. "One day," he says, "when watching a small column of these ants (*Eciton hamata*) I placed a little stone on one of them to secure it. The next that approached, as soon as it discovered its situation, ran backwards in an agitated manner and soon communicated the intelligence to the others. They rushed to the rescue; some bit at the stone and tried to move it, others seized the prisoner by the legs and tugged with such force that I thought the legs would be pulled off, but they persevered till they got the captive free. I next covered one up with a piece of clay, leaving only the ends of its antennæ projecting. It was soon discovered by its fellows, which set to work immediately, and by biting off pieces of the clay, soon liberated it. Another time I found a very few of them passing along at intervals. I confined one of these under a piece of clay, at a little distance from the line, with its head projecting. At last an ant discovered it and tried to pull it out, but could not. It immediately set off at a great rate, and I thought it had deserted its comrade, but it had only gone for assistance, for in a short time about a dozen ants came hurrying up, evidently fully informed of the circumstances of the case, for they made directly for their imprisoned comrade and soon set him free. I do not see how this action could be instinctive. It was sympathetic help, such as man only among the higher mammalia shows." The mutual helpfulness of ants is the more significant since the social mammalia and birds generally attack and put to death any one of their number that suffers from an accident.

The author gives two more instances of reason in ants. "I once saw a wide column trying to pass along a crumbling, nearly perpendicular slope. They would have got very slowly over and many of them would have fallen, but a number having secured their hold, and reaching to each other, remained stationary, and over them the main column passed. Another time they were crossing a water-course along a small branch not thicker than a goose-quill. They widened this natural bridge to three times its width by a number of ants clinging to it and to each other on each side, over which the column passed three or four abreast; whereas, excepting for this expedient, they would have had to pass over in single file, and triple the time would have been consumed." In face of such facts the author asks: "Can it be contended that such insects are not able to determine by reasoning powers which is the best way of doing a thing, or that their actions are not guided by thought and reflection?" This view is much strengthened by the fact that the cerebral ganglia are more developed in ants than in any other insect; and in all the Hymenoptera they are many times larger than in the less intelligent orders, such as beetles, or than in those short-lived emblems of immortality, the butterflies.

During a recent visit to the Isthmus of Panama we had an opportunity of observing the habits of some of these ants. We were walking in the lower part of Aspinwall, not far from the boarding-house or "hotel" of the Pacific Mail Steamship Company, when we noticed a double line of the little animals on the grassy margin of the gravelled path we were following. On close inspection we saw that the lines were moving in opposite directions, and that one was made up of ants bearing what appeared to be green leaves about half an inch in diameter, while in the other the insects were evidently going to get a similar load. We traced the moving columns backward to a hole an inch or more in diameter, the entrance to their underground habitation, and then forward for a distance of full two hundred feet to a shrub in the garden of the hotel, where we found the creatures busily engaged in cutting segments from the leaves, which were much too large for them to carry entire. The order maintained by the two lines was admirable. They were as close together as they could well be without interfering with each other, and yet they rarely got in each other's way. The laden column, with its bits of leaf borne erect like green banners, marched with military precision, though the road, for soldiers of their stature, was a very rough one. Now and then an unlucky fellow would stumble against one in the other line, whereupon the latter would "pitch into" him with the utmost ferocity. We were afterwards told by a friend who resides in Aspinwall, that if the track of these migratory ants be blocked for a moment by a piece of plank, as soon as it is taken away the crowds that have gathered on either side attack each other furiously, and a regular battle ensues, in which considerable numbers are likely to be slain. Each party apparently believes the other to be responsible for the temporary obstruction of the road.

As regards their social condition, ants differ from men in having established communism on a successful basis. At the present day, as a recent writer in the *Quarterly Journal of Science* remarks, all the social Hymenoptera must be viewed with intense interest on account of their working order, or "neuters." These, it is well known, are females whose normal development has been checked; and the writer to whom we have referred asks somewhat mischievously: "Are we to assume that 'once upon a time' a woman's rights movement sprung up in bee-hives and ant-hills, which ended in reducing the males to a very unimportant position, and in limiting the number of the fully developed females? Are we to expect that the 'strong-minded' ladies who are now arising among us are the forerunners of a 'neuter' order, and the heralds of a corresponding change in human society?"

THE SCIENCE OF ADULTERATION.

BY S. P. SHARPLES, STATE ASSAYER.

I.

In the great "struggle for existence" each endeavors to undersell his neighbor, and too often if this cannot be done by honest means fraudulent are employed. It is extremely difficult to obtain any exact knowledge of the methods employed in adulteration or the articles used for the purpose. The scanty information that we possess is mainly the result of examinations made by chemists, or in some few instances it has been brought out during criminal trials. We have all heard how the man endeavored to make his horse live upon sawdust, and some of the enterprising gentlemen in the grocery business seem to be endeavoring to accomplish the same thing with variations.

Cream of tartar is one of the favorite articles for these operations, and in this case the retail grocer is equally to blame with the wholesale. If he buys cream of tartar ground at a less price than crude argols are selling for, he must certainly know that it is not pure. We have known instances in which the powdered article was sold at 37 cents per pound when crystals unground were selling at 40 cents, and examination showed a considerable amount of gypsum: and we found that terra alba or gypsum was regularly sold for this purpose. Another adulterant for this article is bisulphate of soda, or salt-cake. This is more difficult of detection than the gypsum. Pure cream of tartar is perfectly soluble in a weak solution of caustic potassa, and chloride of barium should not produce more than a trifling cloudiness in the dilute solution when acidified by hydrochloric acid.

Salæratus, or bicarbonate of potassa, has of late years been almost altogether replaced by bicarbonate of soda, which salt is now often sold under the name of salæratus. This is generally pure and of good quality. The consequence of this state of affairs is that the cook finds that her two teaspoonfuls of cream of tartar no longer neutralize the one of salæratus, but she has to heap the cream of tartar, or use three parts to one.

Baking powders when pure are a mixture of equivalent parts of cream of tartar and bicarbonate of soda, or of tartaric acid, starch, and bicarbonate of soda, the starch being added to preserve the mixture from the effects of dampness. But it has become quite common to add one fourth part of starch to the first of the above mixtures. This diminishes the cost considerably.

The higher grades of sugar are nearly pure, the only adulterant used being a slight facing of ultramarine or Prussian blue to give the desired bluish tinge to a granulated sugar made from a low grade of raw sugar. This can generally be detected by close examination, especially with the microscope. As much molasses as possible is left in the low grade sugars; this serves to attract moisture from the air and keep them damp. At present rates the higher grades are the cheapest.

Syrups are at present largely made from starch, and sold as a substitute for those made during the process of purifying cane sugar. If starch is boiled for some hours with dilute sulphuric acid and the acid is then neutralized with carbonate of calcium, an excellent article of syrup is produced. This is further purified from iron or other metallic substances by sulphide of calcium. I can see no possible objection to the use of these syrups for food, if they are carefully made.

Much of the syrup in the market contains considerable iron. This has been the cause of a great deal of needless alarm. Many persons have observed that when a drop of tea chanced to fall upon the syrup on their plates a dark spot was produced, and have argued from this that the syrup was poisonous, whereas it only contained a little iron, derived no doubt from some of the apparatus used in its preparation. The tannin in the tea produces the well-known black color of ink.

HOW TO MAKE COFFEE.

Much has been written on the making of coffee, and patent coffee-pots and other apparatus, of more or less intricate construction, have been devised for the preparation of the popular beverage; and yet it must be confessed that a really good cup of coffee is rather the exception than the rule. The problem is not so simple as it seems at first thought. The virtue of the coffee berry consists in its volatile aroma and its fixed extractive matter. To prevent the former from escaping into the air and the latter from remaining in the grounds is the desideratum, but the ordinary methods of doing the one interfere with doing the other. By the French plan of filtering boiling water through the ground coffee, the aroma is readily extracted, but the fixed matter is mostly left behind. On the other hand, by the common Yankee plan of boiling the grounds for a long time in water, the extractive matter is utilized, but the aroma flies off with the steam. Prof. C. A. Seely has contrived a very sensible process of killing both birds with one stone, which he thus describes: —

"I take rather more than the usual amount of coffee, and pour on it hot water when it is ready to be used; in other words, I make French coffee. The grounds from this operation I leave to soak in the pot till the next day, when I begin coffee-making by pouring hot water on these grounds, which hot water I use according to the French plan in making coffee from fresh-ground coffee. The process is now in full operation, and every time coffee is wanted the manipulations of the second morning are repeated. I thus extract all the soluble and useful matter of roasted coffee, and waste nothing. To put the art in the most practical form, I have found it necessary to modify the coffee-pot. Perhaps the simplest apparatus is the most ordinary pot provided with two strainers. The strainers are of cup form, and fit into each other and into the top of the pot. For use I set a strainer on the top of the pot, and in the strainer I place fresh-ground coffee; over this I use the second strainer, containing the grounds of the last operation. Now hot water is poured into the upper strainer, and percolates down into the pot, carrying with it all the goodness remaining in the grounds, and the aroma and much of the extractive of the fresh-ground coffee. When the water has passed down, I throw away the now useless contents of the upper strainer, and upset the contents of the lower strainer into the pot."

THE STRUCTURE OF A COW'S HORN.

The most familiar of natural objects are often beautiful examples of engineering structure. Mr. Frank Buckland, the eminent naturalist, gives a good illustration of this in the following description of a cow's horn which we find in a recent number of *Land and Water*: —

I find that over the brain of the cow a strong roof of bone is thrown, in the shape of an arch, so as to form a substantial foundation for the horns. This roof is not solid, but is again strengthened below by a series of bony arches, that are so distributed as to form a series of hollow chambers, thus forming a structure uniting strength with lightness. The problem now is, how to fasten the horn on each side on to this buttress. The horn itself must of course be formed of horn proper, *i. e.*, hardened hair. In the rhinoceros we find a horn composed entirely of a solid mass of what is really a bunch of hair agglutinated together; but this kind of horn would have been much too heavy for the cow's convenient use. What is to be done? Why, hollow out the centre of the horn, of course; but stay — this will not do, because how is the horn to be supplied with blood-vessels? in fact, how is it to grow? Let us see how it is done by the Great Designer. Cut the horn right across with a saw, and you will find inside another horn, only made of bone. If the section is made about one third of the way down the length of the horn, you will be able to pick out a piece of bone in the shape of a cone, on which, or rather round which, the horn proper has shaped itself. This bone fits the cavity with the greatest accuracy; it is as light as the thinnest paper, and yet as strong as a cone of tin. It is everywhere perforated with holes, which in life contained the nerves, the veins, and the arteries; and we know a cow has all these in her horns: nerves, proved by the fact that cows do not like their horns touched, and that they can scratch a fly off their hides with the tip of the horn; arteries and veins, proved by the fact that a horn, when broken, will bleed, and that the horn of a living cow feels quite warm when held in the hand, besides which the nerves and arteries form a union between the internal core of bone and the external covering of horn proper.

If we now cut the rest of the horn into sections, we shall find that the inside of the bony part is really hollow, but that very strong buttresses of bone are thrown (about every inch or so) across the cavity of the horn in such a manner as to give it the greatest possible support and strength. I have cut a cow's horn and skull into several sections, to show these buttresses of bone, and now that the preparation is finished, I have another specimen to show that there is design and beauty in all created objects.

FAMILIAR SCIENCE NOTES.

Does Mechanical Vibration Retard Rusting? — In our opinion, it does. Years ago, we noticed the fact that iron rails over which trains regularly run do not soon rust, while those that are not used rust rapidly, and we knew of no way of accounting for the difference except by assuming that it was due to the vibration to which the former are subjected. At the late meeting of the American Association, Professor Haldeman read a paper on this subject. He referred to facts like the above, and also remarked that when a rain of some hours' duration falls upon rails in a state of rest, as upon Sundays, when trains do not run, they soon exhibit rust. This would seem to indicate that in chemical combination mechanical vibrations may interfere with the molecular arrangement of the elements. The accuracy of these casual observations should, however, be submitted to the test of experiment. In the discussion which followed this brief communication it was suggested that possibly the oil employed upon locomotives might be more or less spread in a thin film over the rails in use, and thus prevent their oxidation. This view was earnestly combated by other speakers. Professor Van der Weyde was quite certain that the suggestion of Professor Haldeman bore reference to a fact in physics. Molecular vibrations tended to prevent rust. A saw hung up, unused, would soon become rusty; if used, would keep bright. This was a general experience with tools.

A Singular Wasp's Nest. — The London *Garden* says that at the residence of Mr. Clibborn, near Clonmel, the gardener lately found a strange-looking object suspended from a slender branch of an apple-tree. It was nearly spherical, about as large as an ordinary-sized cannon-ball, and was streaked all over with the brightest colors. He soon discovered that it was a wasp's nest, but for some time was puzzled to account for its varied tints and singular formation. At length the problem was solved. Mr. Clibborn had, some time before, procured a quantity of long paper "shavings" of different colors — red, blue, green, yellow, and white, which he flung over his strawberry beds, to protect the fruit from the attacks of birds and insects. A colony of wasps, instead of being "warned off," made frequent visits to these colored streamers, and, with singular ingenuity, reducing the paper to pulp, soon carried it away for the construction of their nest, which quickly grew under the united efforts of quite an army of these busy little artists. The most wonderful part of their work is the regularity of those undulating lines of color as they were carried around from side to side. This curious nest has been preserved intact, and it is now an object of much interest to visitors.

Ozobenzine. — Foreign investigations of the action of ozone upon certain hydrocarbons, have lately led to the discovery of an interesting substance to which the name of *ozobenzine* has been given. Pure benzole (boiling at 81° C.) yields, under the action of ozone, acid products, including formic and acetic acids, and at the same time a gelatinous body separates, which is the ozobenzine. When dried in vacuo, this ozobenzine is an amorphous solid, explosive to such a degree that an explosion ensues whenever it is struck or heated. The explosion of only a few decigrams of the substance will shatter the windows of the room. It is so dangerous that not more than three to five milligrams should be used for the experiment. Ozobenzine is readily and, apparently, spontaneously decomposed in the air, in vacuo, or in an atmosphere of carbonic acid. Water dissolves and decomposes it.

Early Use of Iron. — At Ilchester, Eng., not long ago, some workmen, whilst digging for ironstone, came upon a stone coffin 6 feet from the surface, the body of which was hewn out of solid stone, and the lid, composed of one slab of stone, was made fast to the body of the coffin by four wrought-iron clamps, fixed in the stone in the same manner as is usual in the present day. On removing the lid it was found that the principal bones of the arms and legs, together with a portion of the skull (to which was attached a small quantity of apparently light auburn hair), alone remained; the rest had returned to dust. From the leg bones was collected some fibrous substance, which on closer examination appeared to be part of a burial garment. This burial-ground, on which the remains have been found, is hard by a Roman encampment. Other rudely made tombs have been discovered, consisting only of loose pieces of flat stone, placed vertically, and surmounted by a stone slab. Several bronze bowls have also been found; two of them, which were beautifully perforated, were evidently used for culinary purposes. Coins of Faustina, Adrianus, Gratianus, Antoninus, and Constantinus have been picked up in the vicinity, clearly denoting the age to which they belong.

Practical Chemistry and the Arts.

NEW PROCESS FOR RENDERING WOOD INCOMBUSTIBLE.

An English clergyman, the Rev. Dr. Jones, has distinguished himself by inventing a process for rendering wood incombustible, for which he has obtained a patent. The wood is at the same time made impervious to dry-rot and decay, so that two important ends are attained at once. Most of the old methods of preserving wood only render it more liable to fire, as was shown not long ago in the burning of the landing-stage at Liverpool. Dr. Jones subjects the wood to a "pickling" process in a solution of tungstate of soda and water, of the specific gravity of 1.2. The tungstate is made by the addition of tungstate of lime to hydrochloric acid and salt, and it produces in the process as much chloride of lime as will pay all working expenses. The tungstate of soda, from experiments that have been made publicly and privately during the last three years, is proved to render soft woods, such as white and yellow pine, as hard as oak or teak, and it will also restore wood that has been affected by dry-rot to the original condition of durability. The London *Daily News* gives the following account of some experiments recently made at Godstone to test the value of the new process: —

The experiments made were three in number, and the tests were undoubtedly very severe. Two small pyramids of sticks were made, one of prepared and the other of unprepared wood. These were then well saturated with paraffine, and ignited. In the case of the prepared wood the paraffine soon burnt itself out without communicating the flames to the wood, which was only slightly charred. The other heap burnt fiercely, and in half an hour was reduced to ashes. The next experiment was made with two wooden huts, one of which had been prepared, while the other, built of ordinary Scotch fir, had not. A strong fire sufficient to ignite the houses was made in each, and the effect was about the same as in the preceding experiment. A chest containing a parchment document had been treated by the process, and was thrown into the flames when at their height, and was taken out some time afterwards, charred indeed as to the outside, but practically uninjured in any other respect. The inside was quite cool, and the wax seals upon the document were intact. Perhaps the most important trial was that which took place with gunpowder. A government gunpowder keg which had been rendered fireproof was used for this experiment. A paper packet containing about two ounces of gunpowder was put in the bottom of the keg, and a sheet of brown paper impregnated with the tungstate was pasted over it, and dried. The keg, which was open at the top, was turned upside down, and surrounded by shavings, which were lighted. A fire of petroleum and shavings was kept burning on the top for about a quarter of an hour, without producing the slightest effect on the keg. To make the trial still more complete the keg was reversed again, and lighted shavings were thrown in upon the gunpowder, protected only by a sheet of brown paper. The paper stood the test admirably, and the solution rejected the fire so thoroughly that the paper did not even show a sign of charring. The gunpowder was then taken out and exploded. The properties of his invention, Dr. Jones states, would give the navy the advantage of being always sound in hull and free from any danger of fire, whether from accident or from shot and shell. It would also be a great saving to the nation in preventing the necessity of continually docking and repairing ships. According to government statistics the cost of the renewal of telegraph poles is £240,000 ($1,200,000) per annum, and this, it is said, would be saved by the use of Dr. Jones's process.

MEMORANDA IN THE ARTS.

Wood Carpets. — The London *Furniture Gazette* thus describes the manufacture of these carpets as conducted at Glasgow: "The woods used for this purpose are various, according to the design. In general they are simply varnished, and show the grain. The carpet is made by cutting the wood into pieces 3 in. broad by $\frac{1}{8}$ in. thick. These are again cut to the shape required by the design, chiefly triangles, rectangles, etc. The different pieces are next glued together in a frame constructed for the purpose. The piece of mosaic thus formed is sent to the saw-cutting shop, where it is cut up into three thicknesses. The great difficulty at first experienced was to get these different pieces so closely and strongly joined that they would not come asunder when subjected to the cutting process; but it was found that with care in piecing and the use of good glue, the whole might be as easily and securely cut up as though it were one plank being sawn into veneers. The back, formed of strong canvas, is glued on, a fine gluing table being employed for the purpose, the heating apparatus of which is situated underneath. When the mosaic front and the canvas back are thoroughly united together, the face is carefully smoothened by a hand-plane, and every irregularity of surface completely removed. It is now ready for the French polishing, which is done principally by girls. When finished there is no seam whatever apparent; it is only when rolled up that the seams are noticeable between the different three-inch breadths. The material is sent out in webs, and may be exposed to any climate. It may be used for the entire covering of the floor, in which case a rug or two in suitable places will have a very elegant effect; or it may be used as a bordering to an ordinary carpet. Its cleanliness, warmth, and durability are not the least among its recommendations. It is a really valuable adjunct to house decoration, and will commend itself wherever artistic effect and comfort are studied."

A Peruvian Mining Centre. — Probably few of our readers have ever heard of the city of Pasco, high up among the Andes of Peru, but it is a place of no little mercantile importance, with 30,000 inhabitants, full of English and other European commercial houses, including among them discount and other banks. There are also several magnificent hotels and other houses of entertainment. Among its extensive treasures of copper, silver, and gold, there are in the vicinity of Pasco 200 silver mines, in actual working, and there are nearly 1700 mines of all sorts, permission to work which has been granted by the government to natives and foreigners, the proportion of metal being from 10 and 15 to 3000 lbs. in a block of 50 cwt. It has been calculated that the mines of Pasco have produced 160,000,000 oz. of silver, being double, or more than double, all that the rest of Peru has produced during seventy-six years. The hill of Pasco is intersected with veins of pure silver, sulphides of silver and copper, carbonate of copper, and silver pyrites; and besides the 2000 mines, there are 1300 places where the gold cropped out. Its gold mines, which in 1805-10 yielded to the Spanish government about five millions of dollars, are now no longer worked, because the miners confine their labors to the silver. The hill of Pasco might become a great centre for a mining colony, and maintain 300,000 laborers with a tenth of the produce of the valley of Jauja. The mineral hills of Santa Rosa, Lauricocha, and Yauacaucha, with the forty little hills which surround them, all having the same geological formation, and united by the local railway, have 290 mines in working, and are intersected with iron pyrites and other minerals, which, when smelted, produce valuable metals, from bright, shining silver to sulphides of copper. The gold ores found in the hills of this district have always produced from 2 to 4 lbs. of gold in a block of 5000 lbs.

The English Channel Transit. — If the discomforts of the passage between England and France are not soon obviated, it will not be for lack of plans and devices to bring it about. Besides the Bessemer ship and Captain Dicey's twin ship, the Castalia, and the proposed tunnel, which really now seems to be taking a practical shape, there is a new French invention which may be called a development or "extension" of Captain Dicey's. It is the device of a M. Tellier, who, instead of two, joins together four large vessels, 250 metres (820 feet) long, by 45 metres (147 feet) wide. These vessels, constructed in a substantial manner and divided into water-tight compartments, are united by a common deck, forming an immense raft, on which are arranged all the appliances necessary for the passengers and merchandise. M. Tellier intends even to lay down a line of rails on this deck, so that a whole train may run upon it for being carried across the channel. The vessels will serve as floats, carrying nothing but their engines, their coal, and the necessary machinery for working them. In order to avoid, or rather to lessen the impact of the waves, the inventor fixes firmly to each side of the vessel, and forming with it an angle of about 45°, an iron plate 12 millimetres thick, hoping that the waves will break upon this surface as they do upon the shore, and thus have less effect upon the raft.

A New Application of Telegraphy on Railways. — An English journal says: "A decidedly novel invention has been suggested during the last few days. It is to affix lamps to the telegraphs by the side of the railways, and enable the telegraph clerks at the nearest station to light them by electricity from the station whenever there is danger on the line, the idea being that as soon as the driver of a train saw these lights burning he would bring his engine to a standstill, and remain standing until he received instructions to proceed."

PRACTICAL RECIPES.

Crayons for Drawing on Glass. — Melt together equal quantities of asphaltum and yellow wax; add lampblack, and pour the mixture into moulds for crayons. The glass should be well wiped with leather, and in drawing be careful not to soil the glass with the fingers. In trimming these crayons, if the edge be bevelled, like scissors, the point may easily be rendered very fine.

Restoring Ivory. — Discolored ivory may be restored to its original whiteness by cleaning it with a paste, composed simply of burnt pumice-stone and water. After cleansing, place the article under a glass in the sun's rays.

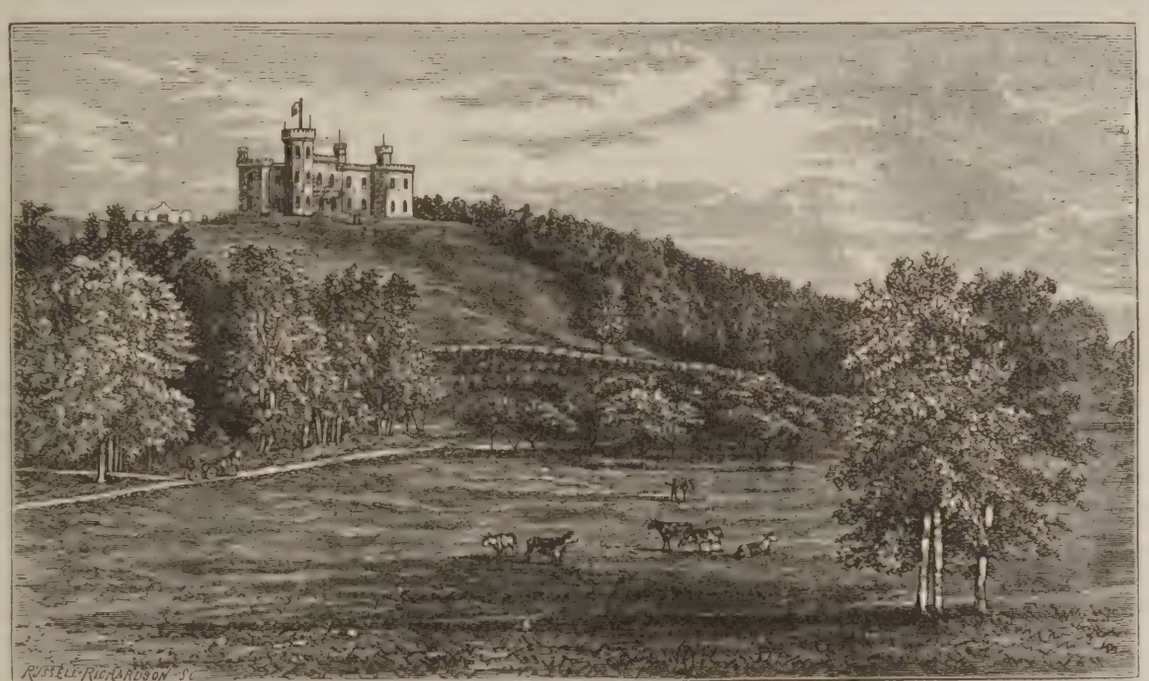
Viennese Meerschaum. — The product known as Viennese meerschaum is prepared by mixing 100 parts silicate of soda with 60 parts of carbonate of magnesia and 80 parts of the native meerschaum or pure alumina. This mixture is then pulverized with the greatest care, and passed through a sieve of very fine silk or horsehair; add water, and boil it for ten minutes; then pour the whole into moulds, placed so that the water may separate easily.

Glue to Resist Fire. — The London *Furniture Gazette* gives this recipe: Mix a handful of quick-lime in 4 oz. of linseed-oil; boil to a good thickness, then spread on plates in the shade and it will become exceedingly hard, but may be easily dissolved over the fire, and used as ordinary glue. It resists fire after being used for gluing substances together.

Agriculture.

LAKESIDE FARM.

So manifest has been the interest felt by our readers in Lakeside Farm, and the experiments carried on there during the past ten years, that we have had engraved a cut for this number of the JOURNAL, in which is presented a view of a portion of the farm, with the new stone buildings just completed on the hill. This view does not afford a glimpse of either of the beautiful lakes which border upon the farm, as it was found impossible to give in a cut of limited size more than a small section of the estate. The view embraces a part of the meadow in the foreground, with the vineyard and orchard at the base of the hill, the two oak groves upon the right and left, sloping the one on the left to Lake Kenoza, the right to Lake Saltonstall. The driveways seen at the margin of the grove at the left lead through the grove to the hill, and to Lake Kenoza, upon the shore of which there are boat-houses, rustic arbors, and a stone cottage for private picnics. The farm-houses, of which there are two, with barns, out-buildings, etc., do not appear in the cut. They are situated upon the highway in front of the meadow. This highway leads past the birthplace and early home of the poet Whittier, and is the one alluded to in "Snow Bound," Whittier's most beautiful poem. Beside the two lakes just mentioned, there is still another, Round Lake, two hundred rods from the dwelling, directly in front. This lake supplies the neighboring city of Haverhill with water by aqueduct.



WINNEKENIE HALL.

Lakeside Farm, or the larger portion of it, was purchased in 1863, and it now consists of about one hundred acres. It was purchased because of the extraordinary natural beauty of the tract, and because it was well adapted for experimental purposes. As has been before stated in the JOURNAL, it was in a run-down condition at the time of purchase, covered with rocks and bogs, and producing only hay, and that of an imperfect quality. The prominent object in view was to ascertain if a farm in poor condition could be brought into a good state of tilth by the use of chemical fertilizers alone. The first three years but little stock was kept, and no animal excrement was employed in the fields; they were dressed entirely with chemical fertilizers. By their use we brought the land into good condition, so that seventeen cows, a yoke of oxen, and five horses have been sustained upon its products. At the present time it yields more than fifty tons of hay annually, and heavy crops of the cereal grains. The stock produce at present all the manure needed, although on some portions considerable quantities of artificial fertilizers are still used. We are not aware that any experiment of the kind has been tried elsewhere in this country, and the results are of great importance to agriculture.

The stone structure seen upon the hill is of a form and design quite unusual in this country, and adds greatly to the picturesque appearance of this beautiful lake region. It is indeed a nearly perfect reproduction of the mediæval castles seen in England, France, and upon the Rhine. Aside from the design of erecting a pleasant summer residence at the farm, we desired to prove to farmers and others, in a practical way, the value of the bowlder rocks (so common on almost every farm in the Northern States) as building material. We have alluded to this subject in a former issue of this journal, and therefore will not enlarge at present. We present below a brief notice of the buildings from a Haverhill newspaper. "Winnekenie Hall," the name given to the new place, is one which has a significance in the Indian vocabulary. The Indian word *winnekenie* means "beautiful view," and was often heard to fall from the lips of the red men of this region, as they ascended the hill and looked out upon the magnificent landscape. The lakes grouped together around the farm, and the Merrimack River flowing by their side, afforded fine opportunities for fishing, and to the Indians the locality was a favorite one.

"We recently visited Lakeside Farm, belonging to Dr. J. R. Nichols, and while there had the opportunity of examining the new and beautiful stone buildings which he has been engaged in erecting during the two past seasons. The building beyond all question is the finest specimen of a mediæval castellated structure in the country. Travellers who have visited Europe and resided there state that no more perfect examples of this style of building can be found upon the Rhine, or in other parts of Europe. It is constructed of solid stone, and all the material, with the exception of the capstones for the turrets and towers, was taken from the hill on which the building stands. The stones are all granitic in kind and have been split from bowlders found upon or near the surface of the hill. Dr. Nichols states that all these stones are strangers to each other, and come from different and distant points. From the circumstance that he has found specimens of talcose slate on the hill, peculiar to the Franconia range of mountains in New Hampshire, the opinion is entertained that some of the bowlders have been brought from that distant point. These stones have been transported by glaciers during the great glacial epoch, when all New England was covered by ice probably to a depth of more than 6000 feet. The granite is of differing crystalline structure and chemical composition, and in color is gray, light and dark slate, brown, and rose color. These granitic bowlders, when split up into irregular forms, present a great variety of faces and colors, and constitute, in our view, the handsomest and most durable building material that can be procured. If any one is inclined to dissent from this opinion, let him look at Dr. Nichols's buildings at Kenoza Lake.

"The buildings are very solid, the foundations being four feet in thickness, and the walls above, twenty inches. Both the dwelling-house and stable are stone, the former covering about three thousand five hundred square feet of surface, and the latter nearly two thousand. The castle has four towers, and the walls are battlemented, the battlements being of solid granite. In the construction of these buildings over thirty thousand cubic feet of stone have been used, and many hundred casks of lime and cement. Two of the towers may be designated as martello towers, and spring from the angles of the walls; two others, one round and one octagon in form, have their foundations upon the ground, and rise to an altitude of about fifty feet. These towers, by their gracefulness and beauty and perfect symmetry win the admiration of every beholder. The building is so broken by angles and projections that no long lines meet the eye, and the whole appearance is unique and pleasing, affording a perfect idea of the structures of the Middle Ages. The battlements project from four to eight feet above the roof, affording a safe and delightful promenade upon its level floor. The octagon tower is ascended from the roof by a spiral staircase, and from this point the view is unsurpassed in extent and picturesque beauty. From this tower the visitor looks into seventeen towns, three counties, and three States. Three beautiful lakes, Kenoza, Saltonstall, and Round, are in full view below, and two of them ripple their waves at the base of the hill upon which the castle stands. To the south the Merrimack River is seen winding its way to the sea, and in the distance the sea itself is visible to the unaided eye. All around are rollicking hills, green fields, and lovely woods, and the city is in full view but half a mile away. On the farm itself, which lies spread out before the visitor in all its greenness and fertility, there are three beautiful groves, two of which border upon Kenoza Lake. These are of oak and maple, clean and sweet as woods can be, and there are drives and paths leading through them in all

directions. In the west, upon the distant horizon, ranges of mountains lift their tall peaks towards the skies. The most notable of these peaks is Monadnock, in Jaffrey, N. H. To the north the Deerfield mountains are seen, and eastward old Agamenticus in York County, Me., rises into view.

"Here we have a combination of lake, river, ocean, hill, mountain, and forest scenery, spread out in one vast panorama. Can this be excelled in picturesque beauty anywhere? We think not. It is not our intention at this time to present any details of this interesting structure, but at some future time will endeavor to give a more careful and minute description. The erection of this mansion has been a surprise to our citizens, so quietly has the immense labor been performed. But few have been aware of Dr. Nichols's intentions, and it has appeared to spring out upon the hill suddenly, as if by magic. The doctor has given the building his constant personal attention, hardly a stone having been put in place without his notice. The general plans are his own, and have been put into working condition by Mr. C. Willis Damon of this city.

"The finish is to be of hard wood, ash and walnut. The number of rooms is fifteen, beside the spacious hall, sixteen feet square. The extreme length of the family room or parlor is thirty-one feet, and width twenty-two feet. The labor has all been done by the day, no job work being allowed in any department. The solidity and thoroughness of the structure is observable throughout. It is an ornament to the suburbs of our city, and one that will endure for ages. The position is so commanding it can be seen from all points miles distant from the city." — *Haverhill Publisher.*

CHANGE IN GLASS FRUIT JARS.

Dr. Nichols, — I inclose a sample of scales or flakes that are thrown off from the inside of a common glass fruit can called "The Gem," which I think was manufactured at Pittsburg, Pa. The can was filled in the summer of 1873 with "red Antwerp" raspberries, in the usual way of canning fruit. The fruit was used out last winter, the can cleaned and set away dry for future use. The last summer when we wanted to fill the can we found more than a tablespoonful of the flakes such as I send you. We emptied out the flakes clean, and set the can by to see the result: it still continues to flake. The glass looks clear and transparent as it should. I have inclosed it and would like to have your opinion of the cause of the change, and whether such cans would be safe to use. Geo. H. Norton.

East Pembroke, N. Y.

Remarks. The sample received in connection with the above consisted of very beautiful fine crystals, which when carefully examined were found to be glass. They were insoluble in boiling nitric acid, and other tests proved them to be glass, or a silicate of soda. The spontaneous disintegration of the glass jar is certainly singular, but not altogether without precedent. The same results have been observed in ammonia bottles left dry, and in some other instances. The glass is not poisonous in itself, but it might prove disagreeable, if not dangerous, under some circumstances. The change is not liable often to occur, but it may be well to examine glass fruit jars carefully, before using them.

THE POTATO IN EUROPE.

The *Horticulturist* states that it is not true, as popularly supposed, that the potato was first brought into England by Sir Walter Raleigh. John Hawkins first introduced it in 1565; next Walter Raleigh, in 1584; finally, Admiral Drake, in 1586. The potato was introduced into Germany just one hundred years ago; and the year 1874 is to the Germans their great potato centennial, which they propose to honor with befitting ceremony. When the Spaniards conquered Peru, in the sixteenth century, they carried some potatoes to Europe, and sent them to the Pope. The raw plant was cultivated a little in Spain, Italy, Burgundy, and the Netherlands, and from a certain resemblance to the truffle, an esculent fungus growing in the earth, the Italians gave potatoes the name of *tartufi*, or *tartufoli*, whence the Germans derive their word *Kartoffel*. The French call them "apples of the earth," *pommes de terre*, while in Austria and portions of Germany the equivalent expression *Erdapfel* is used. Admiral Drake, in 1586, in England, sent some to a friend to plant, with the remark that the fruit was excellent and nutritious, so that it would be very useful in Europe; his friend planted the tubers, and they grew nicely, but when the seed-balls were ripe, he took these instead of the tubers, and fried them in butter, and, sprinkling sugar and cinnamon over them, placed them before some company as a great rarity. Of course these balls tasted disgustingly, and the assembly concluded that the fruit would not ripen in Europe. The gardener pulled up the plants and burned them; but a gentleman who chanced to be present stepped on one of the baked potatoes as it lay in the ashes, when it broke open, and he noticed that it was white as snow, and mealy, and had such an agreeable smell that he tasted it and found it very palatable. The new vegetable was thus rescued; but for a century after it was only cultivated in his garden, and in 1600 the Queen of England made the remark in her house-book that a pound of potatoes cost two shillings.

NOTES ON IN-DOOR GARDENING.

Selection of Plants for Hanging Baskets. — The central portion of the basket should be filled with upright plants of a neat dwarf habit, and around the edge those of creeping or trailing growth. But while a basket filled with any bright, thrifty plants of suitable habit of growth is a thing of beauty, it is far better to make such a combination of color as to present a harmonious living picture. The colors, not only of the flowers but also of the foliage employed, should be studied with a view to this effect. Our greenhouses furnish such a variety of plants with ornamental foliage — crimson, golden, white, bronze, purple, and silvery-gray — that almost any desired effect of color can be produced independently of the blossoms. When a less complicated style is preferred, a basket may be made beautiful by its very simplicity. In such cases a single plant is sufficient, provided it makes up, by its luxuriance of growth, for the lack of variety. We saw a very attractive basket recently, which was completely wreathed with the rich foliage and bright mauve-colored flowers of an ivy geranium. A plant of *Saxifraga sarmentosa*, sometimes called strawberry geranium, set in the centre of a small basket, will soon cover the surface with leaves, while the long tendrils and tassel-like stolons droop gracefully down the sides. Another useful plant in this way is the *Convolvulus mauritanicus*, a single specimen of which will soon make the basket a rich mass of bright green foliage and blue flowers. No one need be deprived of hanging-baskets on account of remoteness from greenhouses, or inability to purchase greenhouse plants. No baskets are produced more exquisite than can be made by judicious use of the plants found in the forests and fields. The basket itself may be made of woven twigs, the end of a little barrel covered over with rustic branches and roots, or a framework of brass or galvanized iron wire. Then, for filling, the forest furnishes abundance of moss, rich light soil, and ferns, partridge-berry, saxifrages, and all the immense variety of other plants which love to nestle in its shades, or seek its open sunny banks.

An Air-Tight Fern-Case. — A correspondent of *The Garden* says: "Our village parson is fond of gardening, and especially of ferns, of which he has a vaseful worth a moment's attention. This vase or pan is made of thin glass, somewhat over a foot in diameter. It was filled with common sandy loam and moss from one of the surrounding hill-sides seven years ago; the ferns were then planted in it, and a glass globe placed over them. This globe has never been removed since that time, and no water or any artificial nourishment of any description has been given them during all these years. The whole is nearly, if not quite, air-tight, so that the dry air of the room has no opportunity of absorbing the moisture which was supplied to them when watered seven years ago. If the pan had been earthenware, moisture would doubtless have found its way through it; but, being glass, it is entirely air-tight. The soil has subsided about an inch; but as seen through the glass, it has still a fresh, nourishing look about it. According to the temperature of the room moisture rises and condenses on the glass and falls again, revealing the beautiful fronds of *Pteris serrulata*, aspleniums, scolopendrums, and similar ferns. All these seem in excellent health, notwithstanding their imprisonment, during which old fronds have died and crumbled into dust, and new ones have taken their place; and now they are in as fine condition as any ferns possibly could be under the most skilful attention. They seem happy in confinement, and look as if they would exist in health and beauty for many years to come."

GLEANINGS FROM ABROAD.

Respiration and Nutrition in Plants. — M. Corenwinder, says *Nature*, has contributed to a recent meeting of the Société des Sciences, of Lille, an exhaustive series of observations on the processes of respiration and nutrition in plants. He supports M. Claude Bernard's view, that the process ordinarily known as the respiration of plants — the decomposition of the carbonic acid of the atmosphere — is really a process of digestion, and that simultaneously with this plants carry on, by day as well as by night, a true process of respiration, similar in all respects to that performed by animals, consisting in an oxidation of the carbonaceous matters of their tissues. By a very careful series of analyses, performed mainly on the lilac and maple, M. Corenwinder determined that the proportion of nitrogenous matter in the leaves gradually and progressively diminishes from the time that they emerge from the bud till their fall; the proportion of carbonaceous matter increases very rapidly during April and May, and then remains nearly stationary till October; while that of the incombustible substance increases during the whole period of vegetation. He distinguishes, therefore, two periods in the vegetative season of the plant. The first period, when nitrogenous constituents predominate, is that during which respiration is the most active; the second, when the proportion of carbonaceous substance is relatively larger, is the period when respiration is comparatively feeble, the carbonic acid evolved being again almost entirely taken up by the chlorophyl, decomposed, and the carbon fixed in the true process of digestion.

Wet Boots and Dry Oats. — We find the following in an English journal, but it is very likely a "Yankee notion" that has crossed the Atlantic: "What an amount of discomfort wet boots entail, and how well we all recall the painful efforts we have now and then made to draw on a pair of hard-baked ones which were put by the fire overnight to

dry. Once on, they are a sort of modern stocks, destructive of all comfort, and entirely demoralizing to the temper. The following plan will do away with this discomfort: When the boots are taken off, fill them quite full with dry oats. This grain has a great fondness for damp, and will rapidly absorb the least vestige of it from the wet leather. As it takes up the moisture it swells and fills the boot with a tightly fitting last, keeping its form good, and drying the leather without hardening it. In the morning, shake out the oats and hang them in a bag near the fire to dry, ready for the next wet night, draw on the boots, and go happily about the day's work."

American Apples in England. — *The Garden* of November 7th says: "American apples of the past season's growth are now selling at moderate rates in provincial towns, both in England and Ireland. The highly colored and well-flavored Baldwin is the commonest kind as yet. As usual, they come in barrels without any kind of packing material, and come, as a rule, in excellent condition. That apples should be sent several thousand miles, and then be sold as cheaply as home-grown fruit, is a noteworthy fact. At this rate of progress, fruitless and cold regions will soon be supplied with the finest fruits at a cost that places them within the reach of all classes."

Hydrophobia among Sheep. — The *Kent and Sussex Courier* reports a case of hydrophobia amongst sheep. Some weeks ago, a strange dog worried a flock of sheep belonging to Mr. J. Rogers, of Upper Hayesden, and bit several of them severely about the mouth, so much so that they could not graze. Some were driven into the river Medway, and swam to an island, from which place they were rescued with some difficulty. Those which had been bitten badly were carefully treated, and after a time recovered sufficiently to be turned out to graze again. They appeared to be progressing favorably till a few days since, when they exhibited strange symptoms, barking like a dog, and flying at any one who came near them. A veterinary surgeon who was consulted ordered them to be killed.

Ants versus Caterpillars. — The Belgian *Official Journal*, referring to the ignorant conduct of those who destroy all kinds of birds and insects indiscriminately, insists on the necessity of children in primary schools being taught to distinguish between useful and noxious insects, and thus to exercise their destructive faculties against the latter only. The writer proceeds to say that the ant, which is very disagreeable and inconvenient in many respects, does excellent service in chasing and destroying caterpillars with relentless energy. A farmer who had noticed this fact, and had had his cabbages literally devoured by caterpillars, at last hit upon the expedient of having an ant hill, or rather nest, such as abound in pine forests, brought to his cabbage plot. A sackful of the pine points, abounding in ants, was obtained and its contents strewn around the infested cabbage plants. The ants lost no time, but immediately set to work; they seized the caterpillars by their heads. The next day heaps of dead caterpillars were found, but not one alive, nor did they return to the cabbages. The value of ants is well known in Germany, and although their eggs are in great request as food for young partridges, pheasants, and nightingales, there is a fine against taking them from the forests. The ant is indefatigable in hunting its prey; it climbs to the very tops of trees, and destroys an immense quantity of noxious insects.

A Cow with a Wooden Leg. — An English country paper records the following fact: A young cow on the farm of Mr. Wilson, in Borrowdale, Cumberland, recently broke her leg. It was amputated, and a wooden leg supplied, and she is now walking about and doing well.

Boston Journal of Chemistry.

Jas. R. Nichols, M. D., *Editor.*
Wm. J. Rolfe, A. M., *Associate Editor.*

BOSTON, DECEMBER 1, 1874.

SANITARY CONDITION OF DWELLINGS.

Notwithstanding the frequency of the warnings which have been given through the press and other channels, regarding the danger of not properly disposing of house waste, many house-keepers continue to utterly neglect all precautions, and kitchen drains and cesspools send forth their poisonous emanations, and fevers and death result. During the past summer, cases of fever resulting from defective house-drainage have been uncommonly numerous in cities and country towns; hotels and boarding-houses at the seaside, and other places of public resort during the summer months, have been changed into pest-houses by the poisonous action of exposed filth and bad drainage. So much suffering has been experienced in these boarding-houses, we incline to the opinion that hereafter the inquiries made by parties from the city regarding them will be directed toward the sink drains, rather than toward corner rooms, luxurious furniture, or rich food. If farmers and boarding-house keepers are wise, they will give prompt attention to matters of cleanliness outside as well as inside their dwellings. The matter of kitchen drains is far too little thought of among all classes in the country. As has been truthfully said, many a tidy housekeeper, whose sink-room is a pattern of cleanliness, and whose sink is as clean as the "plates she eats from," never bestows a thought on the outlet, the care of which, being out of doors, she thinks belongs to the "men folks." Inspection at this unvisited "back side of the house" would show layer upon layer of decaying potato-sprouts, cabbage-trimmings, onion-tops, etc. They lie just down in the beginning of the slight excavation which her husband dignifies by the name of a drain, and she thinks nothing about them till they force themselves upon her attention by sheer accumulation. Then masculine aid is called in, and a few vigorous thrusts with a long pole push the putrescent mass along, out of immediate interfering distance, the wife merely remarking that "the drain did smell awfully when husband fixed it;" but if the poking has happened at the right season of the year, very likely more than one member of the household will have acquired the germs of typhoid, or some other miasmatic disease.

Another wide-spread source of discomfort and ill-health, though happily growing less by the force of circumstances, is the use of feather-beds. These are often precious family heirlooms, and they had an excuse for being while yet stoves and furnaces were unheard of, but are none the less injurious for all that. A coarse sacking, filled with inexpensive straw, forms the "under bed;" on this is laid a huge bag, filled with thirty or thirty-five pounds of feathers. The farmer, with his blood at almost boiling heat, after a day's haying, lies down on this cheap and unpatented vapor-bath and perspirator, and tries to sleep. Is it any wonder that he tosses and groans; that he finds his garments "wringing wet" and himself nearly deliquesced; that he rises with the "first streak of light," from pure misery? The poor wife, who, very likely, in addition to all his discomforts, has suckled an infant all night, finds herself more dead than alive in the morning, and looks forward with justifiable shrinking to the tasks of the day, as she finds "the baby all broken out with prickly heat," and fretful accordingly. No wonder she calls this world "a vale of tears," and considers life a thoroughly puzzling problem.

We have not failed to discharge our duty in pointing out these fruitful sources of disease, as our readers well know, but so indifferent and careless are thousands at the head of families, that the most constant warnings are necessary to awaken them to a sense of the perils which surround them. It is to be hoped that more heed will be given to these important matters.

NEW LEAD MINES.

It is a little singular that what promises to be a very rich lead mine should have been discovered in the rocky pasture just behind the old city of Newburyport, in Essex County, Mass. It is singular because no one has ever suspected that any portion of Eastern Massachusetts was rich in mineral deposits. A vein of lead ore, yielding on analysis about eighty per cent. of the metal, has recently been opened at the place named, which is nearly five feet in breadth and twelve feet in depth, and it is stated that it has been traced a distance of a quarter of a mile. It is probable that several other veins of perhaps equal magnitude exist in the locality, and the region at the present time promises to become one of great activity in mining and metallurgical operations. It is alleged that the ore is rich in gold and silver, the latter precious metal being found to be present in portions of the vein to the extent of one hundred ounces to the ton. This if true would be somewhat extraordinary, as the English lead sulphides which hold ten or twenty ounces are regarded as rich. These ores, when holding but three or four ounces, are considered worth assaying for the recovery of the silver. The demand for lead in the arts and manufactures is so enormous, that fears have been expressed that the supply would become inadequate to the wants of the world. Our mines in Iowa, Illinois, and Missouri give indications of exhaustion, and the English supply, so far as known, is limited in extent. It is therefore fortunate that new deposits of such magnitude have been discovered.

NEW HOMES FOR ARTISANS IN PARIS.

Our readers are familiar with the efforts to furnish cheap, comfortable, and healthy homes for the poorer classes which have done so much in our day to better the condition of workingmen in London and other great cities. But, as a French paper suggested not long ago, the reform might well go a step further, and furnish the workingman at once "a home for his family and *a workshop* for his trade." The plans which George Peabody and more recently Lord Shaftesbury have so nobly inaugurated are excellent for the men who are employed in shops and factories, but useless to the large section of the population who must do their work under their own roof, and who are consequently crowded into cellars and garrets, selected because suitable to their labor, but which have also to serve them for living-room, bedroom, and kitchen, for which they are usually most unsuitable.

The problem of furnishing the artisan a dwelling and workshop combined, each well adapted to its purposes, was not an easy one, but the ingenuity of French architects appears to have solved it successfully in the new "industrial dwelling-houses" recently erected in the Faubourg St. Antoine, Paris, under the plans of M. Emile Lemend. A joint-stock company was formed to secure the execution of his designs, and in the space of one year the enterprise was successfully carried out. The undertaking was a very considerable one; involving the construction of a new street, and the meeting of requirements of a very unusual and novel kind. It is, however, a feat accomplished, and now stands the wonder of the immense faubourg to which it belongs. This street, which the company has handed over complete to the city of Paris, is named the "Rue de l'Industrie."

Part of each house in this long row is arranged for the comfort of the family: water, gas, air, room, light, are arranged so as to meet fully and satisfactorily all requirements. Each of the nineteen spacious dwellings at present erected has a porter, who answers for all the inhabitants of the house.

But the peculiar feature of the buildings is the distribution at will among the local industries of steam from an engine of 200-horse power. This motive power has a constant and regular force, and is distributed in each dwelling on both sides of the street — basement, ground floor, mezzanine, and first floor — by means of shafts and bands, as in all manufacturing establishments. But there is also a scheme for its final application to the other floors, and even in the parts most remote from the centres of action, by means of compressed air, utilized by small engines. A simple tube, like a gas or water pipe, carries the motive power to all these engines. Even the escaped air is utilized, either to blow the forge or to air the workshop.

This union of house and trade presents to the laboring classes the most favorable conditions for good and economical housekeeping. It has been well appreciated by the parties interested, who could not wait till the houses were finished before engaging them; and the company has already more than 160 tenants.

The predominant trade is at present that of cabinet and furniture makers. But the allied industries of wood and metal turning, veneering, manufacturing Paris articles, etc., will soon join these. The houses are arranged for all branches of trade, with or without steam-power.

The Rue de l'Industrie will be a charming little town in the centre of the old faubourg. All the requisite shops are already introduced. There is a bakery, a pharmacy, a public-house, baths, etc. This is the first public enterprise in any country, so far as we are aware, for the benefit of the laboring classes who must work at home. It is already attracting attention in London, and probably some similar enterprise will soon be inaugurated there.

NUMBERS OF THE JOURNAL WANTED. — If any subscriber has No. 1 and No. 11 of Vol. VI. of the JOURNAL, and is willing to part with them, he can receive *one dollar* in cash for each number. Communicate with the office, 125 Milk St., Boston.

IMPURE MILK.

A VERY able and interesting paper on this subject, from the pen of Dr. T. D. Crothers, of Albany, N. Y., recently appeared in the *Philadelphia Medical and Surgical Reporter*. He states that he has generally found that if diarrhœa in more or less severe attacks occurs in families where the people, both young and old, are otherwise generally healthy and well nourished, and living in good hygienic surroundings, it can be traced directly to the milk used in that family. He usually found the cow or cows from which such milk was derived in close, badly-ventilated stables (which were cleaned out only occasionally), and fed on street garbage and brewers' grains. No chemical analysis or microscopic examination was made of the milk, but the diarrhœa ceased permanently on abandoning the use of milk from such cows. He cites the facts established by careful observations in France, made by Dumas, Payen, Boussingault, and, more recently, Decaisne, that milk is healthy in proportion as the animals from which the milk is drawn obtain surplus food above what is needed by the animal economy for daily life. Just as soon as the surplus is reduced, the quality of the milk is reduced, especially in quantity of casein and butter. This fact holds good in human as well as in bovine milk, as was established by the observations of M. Decaisne during the siege of Paris, in 1871. In those cases of want of nutrition, Dr. Decaisne found that the amount of albumen in the milk was in inverse proportion to the casein, increasing as the latter decreased. These experiments indicate that an imperfect condition of health and surroundings destroys the normal qualities of milk. Another kind of impure milk is that which is normal in quality, but contains some accidental poisonous element. Pungent odors around the stables in which cows were milked caused fever in one family in Herkimer County yearly for five years, but this was remedied by thorough cleaning and ventilation of the stables. A third cause of impurity in milk causing disease is the effect sometimes produced by beating or otherwise maltreating the cows. A case is cited where the milk of a cow that was daily whipped to make her stand at milking time produced scrofulous eruptions on the child to whom the milk was regularly given. Another case is described as follows: —

"A highly respected milkman, with a large class of customers, sold out his business, with the cows, to a brutal, intemperate man, who continued the business as before. From some chronic disease he was unable to leave the farm, hence he gave his time to the milking process. Being inhuman and intemperate he beat the cows, often with cruelty. The customers diminished, and complained that the milk was adulterated with some substance which acted on the bowels. At one time a large number were attacked with diarrhœa and cramps, and many bitter complaints were made. Later the property changed hands, and these troubles disappeared. No complaints of the milk had been made before or after this man engaged in or gave up the business, and it was asserted by a workman who remained during this time that the milk was treated in the same way, and not adulterated, leaving a plausible inference that the excitement among the cows at the time of milking was the cause of the bad condition of the milk."

The conclusions to which Dr. Crothers comes are thus stated, and they are of interest alike to dairymen and physicians, as well as to all who use milk as an article of diet: —

"1, Milk from ill-nourished, half-fed cows, having no surplus of food beyond the minimum requirements of nature, is injurious, and may be the source of disease; 2, cows deprived of abundance of good water, ventilation, and exercise, secrete impure and dangerous milk, which may be loaded with gases, animalcules, and fever germs; 3, the milk from old, debilitated cows, fed on grains or over-stimulating food, is also imperfect and unhealthy to a variable degree; 4, the nervous condition of the cow at the time of milking determines the purity of the milk (if this is neglected, the milk is an active source of disease, positively dangerous and fatal); 5, milk adulterated with water is always liable to contain poisonous elements, particularly so in the spring of the year, when all spring and well water is more or less contaminated with surface drainage (this is the most common adulteration, and probably the most dangerous); 6, experience has shown that the milk of one cow, unless the exact circumstances and conditions are known, is not superior to the aggregate milk of the whole dairy; 7, facts show that milk is the prolific source of many diseases now obscure, and unless careful inquiry is made into the condition and surroundings from which we receive our supply, we neglect a sanitary measure of great importance."

EDITORIAL NOTES.

THE METALLIC CHARACTER OF HYDROGEN. — Dr. S. Wroth, of Baltimore, commenting on a paragraph on this subject which appeared in the JOURNAL for August, states that in a popular lecture on chemistry which he delivered in Maryland as long ago as the winter of 1846, he gave reasons for considering that hydrogen ought to be reckoned as a metal; and he remarks that Professor Hare, of the University of Pennsylvania, had previously taken the same ground, and was perhaps the first chemist who suggested the idea. We were aware that hydrogen was long ago suspected of being a metal, but it has not even yet been positively proved such. Professor Bloxam, in the last edition of his "Chemistry" (published in July, 1872), says: "Graham was inclined to believe in the metallic character of hydrogen, or *hydrogenium*, as he termed it. But since the hydrogen [occluded by palladium] is very easily recovered by moderately heating the palladium, and the absorption of large volumes of gases by solid bodies without alteration in the properties of the latter is not at all uncommon, the conclusion is scarcely justified." The question must be still considered an open one.

TELEGRAPH STATIONS AT SEA. — The feasibility of establishing telegraphic communication with ships at sea has been the subject of some discussion of late. Two methods are suggested: one the paying out of a small and comparatively inexpensive cable by the departing steamer, thus keeping up communication with the port of departure; and the other the establishment of cable stations on the high seas, built upon buoys, at which a steamer may stop and communicate, give her time, and enable her passengers also to communicate with their friends on either shore. Although in many cases vessels keep well-defined routes across the ocean, and have thus considerable opportunity of communicating with their friends by means of passing ships, there are tracks which are more solitary than the desert. A passenger by steamship from San Francisco to Japan writes: "During our eighteen days' voyage only two ships were sighted, and those far away on the horizon. Travel on the Pacific is not like crossing the Atlantic to Europe. Our only companions were the sea birds, which followed in the wake for hundreds of miles at a time, and whose untiring flight excited our amazement. A thought

often suggesting itself during the lengthy trip is the comparatively helpless position of persons who might be shipwrecked in the midst of the Pacific. Such a boundless tract of ocean, only broken at intervals by the passage of steamers, presents a terrible prospect to contemplate in case of accident."

Singular Antipathies. — *Chambers's Journal* notices some curious aversions with which various eminent people have been afflicted — for it surely is an affliction to be unable to endure the scent of fragrant flowers or the sight of delicious fruits. The composer Grétry and Lady Heneag (bed-chamber woman to Queen Elizabeth) could not remain in a room which contained a single rose, and it is said of the latter that her cheek was once blistered by having a white rose laid upon it while she slept. The Princess de Lamballe was well-nigh thrown into convulsions by the sight of a violet; tansy was abominable to an Earl of Barrymore; Scaliger paled before water-cresses, and there is authentic record of a soldier, otherwise brave, who would incontinently run from a sprig of rue. "To these instances," says the *Boston Advertiser*, "we can add one equally strange, which came within our own knowledge. The late General Richard A. Pierce, who was Inspector-General of Massachusetts during the latter years of the war, and who was also the commandant of the recruiting rendezvous at Readville, could not bear to look at an apple of any description. His aversion to this wholesome fruit was so great that he could detect its presence in a room, even if it was concealed, and it is said that when a boy at school, he has been made ill by sitting in the seat with a companion who had apples in his pocket. It is within our knowledge that his servant once having inadvertently placed a dish of apples on the table with the dessert, General Pierce was obliged to excuse himself to his guests and leave the room."

"Popularizing Science." — The editor of *Home and School* (one of our best educational magazines, by the bye, and one that often contains excellent articles on popular science) thus facetiously shows up a kind of writing on scientific topics not infrequently found in the newspapers of the day: —

"Prof. Josiah Bliss visits the salt wells of Meade County, Kentucky, and thus in the columns of the *Courier-Journal* poetically and pathetically — but hear him: 'These steam-heated copper pipes convert the fresh water into vapor, some of which is immediately condensed into water through ascending flues, while the former in their passage through the vats of briny water convert the fresh into vapor, and leave the salt, its companion, to crystallize in beautiful network upon its surface by a law *sui generis* into quadrilateral crystals, which join hands with its fellow-crystals, when, poised by its own specific gravity upon the mother-water's bosom like a sleeping infant, it gently sinks to rest on the bottom of the vat.' What rude and sacrilegious hand would disturb the gentle slumbers of this darling infant! Look on this picture, thou incautious youth who defined salt to be 'the stuff that makes potatoes taste bad when you don't put any on,' and blush at thy un-Blissful ignorance. Dream on, sweet babe, in thy crystal bed. No more shalt thou savor pot of ours to convict us of cannibalism and cause our banishment from the realms of Bliss. Rest thee in peace, sweet sal."

ATOMS.

In the new ventilating process introduced this last season into the English House of Commons, a ton of ice is used each night, the air being passed over it before it reaches the chamber. — Thallium in minerals may be detected by the spectroscope when present in the proportion of 1 to 500,000. — Wreaths of artificial foliage and flowers, made of metal, and carefully colored after nature, form a Parisian novelty. — Asiatic locomotives made their appearance, for the first time in the history of the world, last year, when the Bombay, Baroda, and Central India Railway Company built three tank locomotives for freight service at its shops at Parel. — Dandelions are extensively cultivated in France for use as salad, being blanched for the purpose, like celery. — According to the *Journal Vinicole*, the total production of wine in France last year was 35,715,619 hectolitres, the hectolitre being equivalent to 26.417 wine gallons. — In Sweden, gardening forms a part of the educational system; upwards of 2000 schools have gardens for planting attached to them, and the teachers of elementary schools are obliged to learn gardening. — One of the French railways has introduced a new car, called *coupé fauteuil*, differing from the old style of car in having only three seats in a compartment, large and comfortable easy-chairs with no seats opposite them. — It appears that the state railroads in Egypt were worked in 1872-73 at 40½ per cent. of the gross receipts, the gross receipts of the financial year having been £1,478,395, while the working charges were £598,825; the low ratio of the working expenses to the traffic receipts being accounted for by the cheapness of labor in Egypt, and the practice of employing soldiers on the lines. — A curious and costly experiment in paving is being tried at Liège, in Belgium, the road being first paved with stone, then covered with asphalt, and on this are laid blocks of cast iron, two inches thick. — The *Christian Union*, in reply to a question concerning the *Fortnightly Review*, says: "We believe the editor is the gentleman who carries his antagonism to God into typography; denying to a deity who, in his opinion, does not exist the pleasure of seeing himself spelled with a capital G." — M. Tauret, in a communication to the French Academy of Sciences, states that by the slow oxidation of chloral hydrate carbonic oxide is liberated; and he thinks this furnishes a new explanation of the action of chloral on the system, and accounts for the accidents occasionally resulting from its use. — The sending of living specimens of the phylloxera to Paris has been interdicted at the suggestion of scientific men, lest by some accident it should lead to the introduction of the mischievous creature into the northern parts of France, and especially the Champagne district, some years sooner than it would get there at its present rate of spreading. — A large quantity of old iron from the scene of the Crimean war is being converted into ploughshares by a New Jersey foundry. — The great project, undertaken some years since, of tunnelling the Mersey so as to connect all the docks, railways, and canals on both sides of the river, is once more occupying attention in Liverpool; engineering testimony is altogether favorable to the project, while the investigations of geologists made with regard to the special borings necessary to the success of the scheme indicate that there is no serious obstacle between Birkenhead and Liverpool. — The gold diggings in French Cayenne having proved remunerative, the Stadtholder of the Dutch West India Colonies has sent out an expedition to the Maryone River, in the hope of equally favorable results. — Within six years, on the coast of Canada, ninety-eight new light-houses have been built, four new light-ships established, and ten new steam fog-alarms; forty-eight more light-houses, eight fog-alarms, and two light-ships are in process of construction; by the aid of Canadian petroleum oil these are maintained at a cheaper rate than in any other country in the world. — Mr. Thomas Sutton, an English photographer, has discovered that white cotton cloth is rendered water-proof by being dipped for an instant into dilute sulphuric acid. — A recent English writer remarks that "the manufacture of leather has been less advanced by the application of chemical science than any other of the arts; and if Simon, the tanner of Joppa, had been able to send leather to our International Exhibition, no doubt he would have carried off a medal for leather as good, and made by exactly the same process, as that of our most eminent manufacturers of the present day." — The Agricultural Society of France has offered prizes of 1000 francs ($200) each for the best method of artificial irrigation, for the best means of destroying the *Phylloxera vastatrix*, for the best economical means of utilizing the beet root and its products, and for the educational establishment which shall have taken the best means to instruct in agriculture and horticulture.

LITERARY NOTES.

The *Transactions of the American Medical Association for* 1874, forming Vol. XXV. of the annual series, have been published in a neat octavo of nearly six hundred pages. We shall refer hereafter to some of the valuable reports and addresses which make up the bulk of its contents.

The *Massachusetts Medical Register*, edited by Dr. F. H. Brown, and published by W. P. Lunt, of Boston, is a concise directory of the medical societies and schools, hospitals, dispensaries, charitable associations, asylums, etc., of the State, with much other matter that renders it an invaluable practical handbook for every active member of the medical and allied professions.

Messrs. Lindsay and Blakiston have just published *Croup in its Relations to Tracheotomy*, by Dr. J. Solis Cohen ($1.00), an essay based on a careful study of more than five thousand cases of tracheotomy in croup performed in various parts of the world, and endorsed by the Medical Society of Pennsylvania; also *A Guide to Practical Examination of Urine*, by Professor J. Tyson ($1.50), a compact, convenient, and well-illustrated manual for the physician and the student.

The Medical Use of Alcohol is a neat little volume published in New York by the National Temperance Society, and containing three excellent lectures by Dr. J. Edmunds, of London, on the use of alcohol in medicine, in dietetics, and as a stimulant for women and nursing mothers. It deserves a wide circulation.

Eating for Strength, by Dr. M. L. Holbrook, editor of the "Herald of Health," is substantially a hygienic cook-book, containing many recipes for plain and wholesome dishes not to be found in the ordinary kitchen manuals, to which it therefore forms a useful supplement, especially for people of vegetarian tastes.

The third issue in Macmillan & Co.'s attractive "Nature Series" is made up of St. George Mivart's instructive papers on *The Common Frog*, which more than make good the promise of their title, telling us about many uncommon as well as common frogs, lizards, and other reptiles, both existent and extinct. It may be found at Williams & Co.'s, with the other books mentioned above.

The latest number of the "International Scientific Series," of which the Appletons are the publishers in this country, is *Animal Mechanism*, a treatise on terrestrial and aerial locomotion, by E. J. Marey, professor in the College of France. The illustrated articles on "Human Locomotion," and "The Paces of the Horse," in the last two numbers of the *Popular Science Monthly*, are abstracts of chapters in the book, and give a good idea of its masterly treatment of the subject.

Gillmore's *Prairie and Forest*, from the Harpers, is a description of the game of North America, with spirited stories of its pursuit and capture, interesting alike to the sportsman, the naturalist, and the general reader.

Among the other recent publications of the same house are several that deserve more than the brief mention we are able to give them here. The revised edition of *Mill's Logic* is a work which in this new and perfected form more than ever deserves the praise given it long ago by the *North American Review:* "a sort of *Novum Organum*, adapted to the state of intellectual and physical science at the present day; treated with a breadth and comprehensiveness of thought, in a style of thorough analysis, and with a surpassingly clear and forcible diction, which entitle it to the faithful study of all who aspire to the merit of philosophical research or even of general scholarship."

Cairnes's Political Economy is commended by the best critics for the ability and candor with which it discusses a difficult and controverted subject, for its thoroughly practical treatment of the great problems involved, and for its clear and felicitous style. *Lewis's History of Germany* is virtually Müller's celebrated "History of the German People," condensed and made more complete by material drawn from other standard histories. It is a model book of its kind, and supplies a want long felt by American students and readers. *Campaigning on the Oxus*, by J. A. MacGahan, is not only the first detailed and accurate account of the Russian expedition to Khiva, but the first reliable history of the social and political condition of the Khivans and their allies. It is well written, well illustrated, and on the whole one of the most interesting of recent records of travel. Noyes, Holmes, & Co. have all these new books.

Hon. W. M. Evarts's eloquent *Eulogy on Chief Justice Chase*, delivered at Dartmouth College last June, has been published in a neat pamphlet by J. B. Parker, of Hanover, N. H., and is for sale at Estes and Lauriat's.

Medicine and Pharmacy.

DOES THE USE OF FLOUR PROMOTE DECAY OF TEETH?

BY EPHRAIM CUTTER, M. D.

THERE is no doubt that the decay of teeth prevails to an alarming extent, and it is very humiliating to our modern civilization to have it characterized so generally by the occurrence of diseased teeth. The ætiology of this disease is a great, broad, and deep subject. No doubt many elements combine together to cause it; and the person who should positively announce a single agent would be dismissed as unworthy of attention. Still it is a matter worth discussing, and deserving the attention of the ablest minds. To ignore is not to arrest; hence we offer a few suggestions for consideration.

"The *Chemical News* ascribes the potato rot to a deficiency of lime and magnesia in the soil. Different observers state the percentage of magnesia in the ash of sound tubers at from five to ten per cent.; in the diseased tubers an analysis shows only 3.94 per cent. Analysis of sound tubers shows over five per cent. of lime, but in the ash of diseased tubers only 1.77 per cent. was found. A similar observation was made some years ago by Professor Thorpe, with regard to diseased and healthy orange-trees; in the former there was a deficiency of lime and magnesia."

According to these authorities, a deficiency of mineral salts in the vegetations named is supposed to be a sufficient cause for decay. Now it is an interesting question whether there is any article of food employed by mankind which is deficient in mineral matter. If so, then it should be made known to every family in the land.

Perhaps there is no article of food more generally consumed than flour, *i. e.*, wheat flour. In the forms of bread, cakes, and pastry of all kinds, it enters into every house, and is universally used and regarded as the "staff of life."

Does flour possess a requisite amount of mineral matter?

To answer this question, Mr. Sharples, the well-known chemist, analyzed for me the "Peerless Flour." He found 0.55 per cent. of mineral ash, a little over half of one per cent. He stated also that the proportion of ash in the whole grain varied from 1.65 to 2.50 per cent. So that the diminution of mineral food varies from two thirds to four fifths. In other words, *by the use of flour, mankind loses from two thirds to four fifths of the elements that go to make up teeth and bony structures.* This statement deserves to be written in letters of gold over the door of every bakery and kitchen in the land.

Flour has been used for generations, and if we can rely upon Mr. Sharples's statement, mankind has all this while been deprived of the greater moiety of the mineral food that the Almighty intended it should have the benefit of. Is it not natural to expect that the bony structures should suffer from this great withdrawal? For it is a *great* withdrawal. Suppose that a water supply pipe should be cut off two thirds to four fifths, would not the supply be greatly diminished? Cut off the same quantity of time from the hours of daylight; would not our darkness be great? Take away two thirds to four fifths of our muscular food; would not a strong man become very weak? Cut off air to the same extent; would we not lose our breath? And why should the bony tissues not suffer in like manner when their food is withdrawn? I think they do. Perhaps a little evidence in the contrary direction may throw light upon this.

A dentist, whose name is well known, said that he filled some fourteen cavities in the teeth of his first-born child by the time he was four years of age. He put his family upon the use of the whole grains, and the next child had no retarded dentition, and not a decayed tooth up to the same age!

The same gentleman says that the teeth which decay are not compacted or knit together with the firmness of healthy teeth. There seems to be an arrest of perfect development. Though what can be more natural than to expect imperfect development and decay, when from two thirds to four fifths of the proper bone food is habitually withdrawn from an article of diet which is more largely used than any other?

How common it is to see infants not cutting any teeth at all, until they are twice as old as they ought to be. The good effect of the whole grain diet is shown in Dr. Harriman's second child, above alluded to. To be sure, it is only *one* case, and must not be made too much of.

Now what is to be done about it? Certainly one man's dicta amount to but very little alone. What we need is evidence from others. Suppose that every medical association of Massachusetts take up this matter, have analyses of flour made, try feeding mothers and children upon the whole grains of wheat meal, oat meal, corn meal, beans, etc., and suppose they all come to the same conclusion as the writer has done. Suppose they officially announce the result. Would it be long before the general public would heed the truth, and thousands of persons would rejoice in the possession of that priceless treasure, a set of perfect teeth?

NOTE. — Through the kindness of Mr. E. H. Davis, Superintendent of Public Schools in Woburn, Mass., the writer has been furnished with the following *astounding* statistics, embracing returns from several of the largest primary schools of Woburn, a fair representation of the prevalence of diseased teeth among children: —

	No. Scholars.	With Sound Teeth.	Decayed.
Lawrence Primary	113	13	100
Plympton St. Primary	94	27	67
Highland St. Primary	71	25	46

CROTON CHLORAL.

THIS remarkable agent, which Dr. Liebreich discovered a few months ago, has never been quite satisfactorily understood by the medical profession. Dr. R. Engel has with others bestowed much attention upon the agent, and its chemical, physiological, and therapeutic properties have now become better known. The croton chloral has never been manufactured in this country, but in Berlin it is now made upon a large scale. It differs in its physiological effects from chloral hydrate, and in many affections it will be found to possess advantages over that most valuable agent.

Constitution. — Ordinary chloral is an aldehyd; it is the hydride of trichloracetyl, $C_2Cl_3O.H$. Croton chloral is the hydride of trichlorocrotonyl, $C_4H_2C_3O.H$, or the aldehyd of crotonic acid, $C_4H_5O.OH$, in the radical of which three atoms of hydrogen have been replaced by three atoms of chlorine.

Preparation. — Krämer and Pinner were the first to obtain croton chloral by passing a current of chlorine into aldehyd during twenty-four hours. The action is very energetic at the commencement of the operation, so that it is necessary to surround the vessel containing the aldehyd with a refrigerating mixture, and it is only towards the end that the temperature is raised to 100°C. During all the time of the action of the chlorine upon the aldehyd large quantities of hydrochloric acid are disengaged. The product obtained is submitted to fractitional distillation, and a liquid is thus isolated passing over between 163°C. and 165°C., which is croton chloral.

Wurtz had previously studied the action of chlorine upon aldehyd, and had indicated among other products of the reaction chloride of acetyl, and had shown that ordinary chloral is not produced; but the formation of croton chloral escaped him. The reason was that Wurtz caused chlorine in excess to act upon aldehyd, whilst Krämer and Pinner passed a current of chlorine into the aldehyd until it was no longer absorbed.

The production of croton chloral under these conditions is easily understood, since Kékulé has shown that acetic aldehyd, under the influence of various saline solutions, and more easily still under that of hydrochloric acid, is condensed, with the elimination of water, into croton aldehyd: —

$$\underbrace{2C_2H_3O.H}_{\text{Aldehyd.}} = \underbrace{C_4H_5O.H}_{\text{Croton aldehyd.}} + \underbrace{H_2O.}_{\text{Water.}}$$

Further, aldehyd, under the combined action of heat and a little hydrochloric acid, may even be combined with other aldehyds, with the elimination of water, and new compounds be thus engendered, which are themselves aldehyds.

In the action of chlorine upon acetic aldehyd a substitution is commenced in the latter, which results in the formation of hydrochloric acid. This acid determines, as has just been seen, the formation of croton aldehyd; upon which the substitutive action of the chlorine then goes on. The formation of croton chloral is thus readily explained.

Physical and Chemical Properties. — Anhydrous croton chloral is a colorless oleaginous liquid, having a peculiar odor, recalling that of ordinary chloral. It is insoluble in water, but, like ordinary chloral, it combines with water to form a crystallized hydrate. The hydrate of croton chloral crystallizes in white nacreous spangles. It is slightly soluble in cold water, more freely soluble in warm water, and extremely soluble in alcohol (Krämer and Pinner). It dissolves more readily in glycerine than in water (J. Worms).

It is known that ordinary chloral is decomposed under the influence of caustic potash into chloroform and formiate of potassium: —

$$\underbrace{C_2Cl_3O.H}_{\text{Chloral.}} + KOH = \underbrace{CHO.OK}_{\text{Formiate of potassium.}} + \underbrace{CHCl_2.Cl.}_{\text{Chloroform.}}$$

Under the same influence croton chloral breaks up into allyl-chloroform and formiate of potassium: —

$$\underbrace{C_4H_2Cl_3O.H}_{\text{Croton chloral.}} + KOH = \underbrace{CHO.OK}_{\text{Formiate of potassium.}} + \underbrace{C_3H_3Cl_2.Cl.}_{\text{Allyl-chloroform.}}$$

But allyl-chloroform is excessively unstable, and decomposes rapidly into hydrochloric acid and bichlorallylene: —

$$\underbrace{C_3H_3Cl_2.Cl}_{\text{Allyl-chloroform.}} = HCl + \underbrace{C_3H_2Cl_2.}_{\text{Bichlorallylene.}}$$

Physiological and Therapeutic Properties. — According to Liebreich, croton chloral, administered internally, rapidly produces slumber similarly to ordinary chloral, but without its use being followed,

as in the case of the latter, by lowering of the pulse and respiration. Even after the administration of very high doses of croton chloral the pulse is not reduced.

Liebreich thinks that it is not to the first product of decomposition (allyl-chloroform) that hypnotism is due. Allyl-chloroform, being very unstable, breaks up immediately, and he thinks therefore the action of croton chloral should be attributed to bichlorallylene. Moreover, Liebreich has found that bichlorallylene, when administered to animals, does not reduce the circulation or respiration. Comparing the effects of chloroform and chloral on the one hand, and bichloride of ethylene and bichlorallylene on the other, he considers himself justified in asserting that whilst the trichlorinated substances act upon the brain, spinal cord, and heart, the bichlorinated substances act only upon the brain and spinal cord. In none of his experiments has Liebreich recognized any hurtful effects on the stomach or any other organs; and he reports that he has employed it very successfully in cases of facial neuralgia, the pain ceasing frequently before sleep is produced. Jules Worms, however, asserts that croton chloral is not so generally tolerated as chloral, and Georges Gay says that its narcotic action is more uncertain.

Croton chloral is hypnotic in doses of from half to one gram. It may be administered in solution in water, or in glycerine. The following is the formula employed by Jules Worms: —

Croton chloral	1 gram.
Glycerine	60 grams.
Water	60 "
Oil of peppermint	3 drops.
Simple syrup	25 grams.

In a paper contributed to the *American Practitioner* by Mr. Louis Diehl, of Louisville, he remarks that croton chloral hydrate differs from the ordinary chloral hydrate by its sparing solubility in cold water, and in the exceedingly irritant character of its vapor. Chloral hydrate, on the contrary, is freely soluble in water, and its odor when pure is not irritating. Nevertheless, nearly all commercial chloral hydrate has a more or less irritating odor, and it is inferred by Mr. Diehl that this is owing to the presence of croton chloral, formed either from aldehyd, contained as impurity in the alcohol, or from aldehyd generated by the action of chlorine. No experiments have, however, been made by him to prove the correctness of the inference.

Reporting upon a sample of croton chloral hydrate purchased in New York, the original source of which was unknown, he says, "It is a white, powdery substance, of a pearly lustre, apparently crystalline, and when triturated in a mortar has the appearance and feels to the touch like pulverized valerianate of zinc. Its odor reminds of ordinary chloral hydrate and iodoform; does not seem to be more pungent than that of ordinary commercial chloral hydrate, and not as much so as that of some samples I have noticed. Its taste is bitter and aromatic, recalling the odor of iodoform. It is more soluble in cold water than I should have expected from the characteristic, 'sparingly soluble,' given it by its discoverers. Thirty minims of distilled water dissolve one grain readily. If another grain be added to this solution heat is required to dissolve it, and upon cooling and standing a short time a copious crop of well-defined crystals is obtained. Subsequent experiments proved it to be soluble in between twenty-two and a half and twenty-five parts of water, at a temperature of 60°F. In alcohol it was found to be freely soluble."

From these experiments it follows that croton chloral hydrate (commercial) may be dispensed in aqueous solution of a strength corresponding to two grains in the fl. drachm, and Mr. Diehl gives the following formula: —

Croton chloral hydrate	g. viij.
Warm water	fl. ʒi.
Simple elixir	fl. ʒvij.

Ft. solut.

Owing to the alcohol contained in the simple elixir, a larger quantity than two grains to the fl. drachm could, if desirable, be incorporated and held in solution by the above mixture.

CINCHO-QUININE.

Several medical friends in the West write, asking if any notice will be taken in the Journal of the statements recently made by a druggist of Chicago (a Mr. Ebert) regarding cincho-quinine. It may be said in reply that but little is known in this section regarding this gentleman — his competency, responsibility, etc. All we know is that his name appears on the cover of a Chicago publication called *The Pharmacist*, as editor, and in looking over the October number we find the leading editorial to commence in this singular way: —

"The annual *Pharmical* [what does that mean?] gathering has come and gone, and *we* [that is, the editor] are at home and at *our old tricks again*, supplying mankind with *elegant* and *inelegant* remedies, as the occasion may demand."

Whether this be regarded as an advertisement, or the best effort of the editor as an editorial, it certainly is not calculated to heighten one's confidence in the gentleman or his wares. We understand it was at the "pharmical" gathering spoken of (at Louisville, Ky.) that the announcement of the discovery of the nature of cincho-quinine was made to "mankind." A gentleman so busily engaged at his "old tricks" of supplying over the counter to all "mankind," at Chicago, "elegant" and "inelegant" mixtures can hardly be supposed to find time to engage in the difficult and protracted labors of an analytical chemist; and further, such a person can hardly be suspected of possessing the knowledge and experience necessary to make accurate analysis of a complex organic compound like cincho-quinine. No further allusion to the "pharmical" gentleman of Chicago need be made at present.

As regards cincho-quinine, which has now been in the hands of thousands of physicians in all sections of the country for nearly *five years*, it may be said, *it is precisely what it is stated to be by the manufacturers.* It contains *all* the important alkaloidal principles found in bark, cinchonine, quinine, quinidine, etc., in their naked alkaloidal condition, and *nothing else.* It contains no *sulphate* of cinchonine, quinine, or any other alkaloid. It was presented to the medical profession on the theory that *all* the alkaloids of bark in association, uncombined with acids, would prove more efficacious, therapeutically, than sulphate of quinine or cinchonine alone, and the correctness of this view has been most abundantly verified by a vast experience with the agent. Probably ten thousand physicians are using cincho-quinine at the present time in *preference* to sulphate of quinine, and if this fact is not significant of its value, one is at loss to know what would be. It is sold at about one half the price of sulphate of quinine, which is a consideration of no small importance to physicians and patients. The manufacturers, Messrs. Billings, Clapp, & Co., chemists, of this city, will send specimens of the agent free to physicians upon application.

MEDICAL MEMORANDA.

Bone Felon. — The London *Lancet* suggests the following simple treatment: "As soon as the disease is felt, put directly over the spot a fly blister, about the size of your thumb-nail, and let it remain for six hours, at the expiration of which time, directly under the surface of the blister may be seen the felon, which can instantly be taken out with the point of a needle or a lancet."

The following remarks are made upon this item by a medical correspondent in Vineland, N. J.

"I have noticed the *Lancet's* cure for *bone felon* several times in the current medical journals during the past three years, and I think the notice too brief to be understood.

"I have employed this treatment for the past seven years and with results that lead me to adopt it altogether. A piece of adhesive plaster, an inch or more in width and long enough to go once and a half around the finger, should have spread upon it a surface of cantharidal plaster the size of a three-cent piece.

"This surface should be applied over the tender part, and the adhesive plaster carried round the finger and lapped.

"It should remain for twenty-four hours at least, and then, if vesication has occurred, the cuticle may be raised, and beneath it will be found a small opening not exceeding a line in diameter, which penetrates the deep tissues and discharges pus. If the blister is applied during the first three days this is all-sufficient for a cure; and if the disease has run longer than this, its course is shortened and the cure remarkably quick.

"The plaster should remain forty-eight hours when applied to the palm of laboring men, a fresh one being furnished at the end of twenty-four hours. In these cases the opening may be enlarged as the quantity of pus is greater. The pain is greatly diminished during the action of the blister.

"Those who have experienced disappointment at finding no matter after laying a delicate finger open to the bone, and who have seen patients resort to all possible means to avoid the inevitable knife, will be most pleasantly surprised at the efficacy of the blister."

Theory and Practice. — In his inaugural address at St. Thomas's Hospital, London, on the 1st of October, Dr. H. Dickenson defined with much acuteness the relations of theory and practice, on the comparative value of which opinions differ so much in the profession. Giving, said he, due place to scientific or speculative thought on the one hand and to experience on the other, the first was the motive power, the second the controlling influence — the first the steed, the second the bridle. With only the one we should be sure to go astray, with only the other we should forever stand still, or at best limp on in a very halting and footsore style. Theory was insisted on as an idea of purpose inseparable from human action, and practical men who affected to be superior to theory stigmatized as no less theoretical than their neighbors, though influenced not by the rational principles of ripening knowledge, but by the exploded fallacies of the past. "A practical man," according to the great leader whom, as a conservative, practical men should respect, "is a man who practises the errors of his predecessors." No therapeutical suggestion should be discarded as too chemical, no pathological inquiry, however minute, as unpractical, no appliance in aid of diagnosis as new-fangled or superfine. Observations should be trusted, traditions distrusted.

Effects of Imagination. — At a late meeting of the Paris Académie des Sciences a letter was read from M. Volpicelli, of Rome, to M. Chevreul, in which the writer related that a Roman physician had asserted to him that, if a magnet were brought

near to a nervous patient, magnetism had the effect of disturbing him in various ways, and notably in his condition of health. M. Volpicelli goes on to state that, being invited to experiment on a nervous subject at the San Spirito hospital, he practised a little *ruse*, and instead of taking with him a magnet, provided himself with a piece of unmagnetized iron. The patient scarcely saw the piece of iron before he fell into convulsions; his imagination became so highly excited that nervous disturbance of the most extreme character supervened. M. Volpicelli then made a second experiment. A magnet was placed in the hands of another person suffering from nervous disorder, who when a few minutes had elapsed was so extremely excited that it was necessary to take the magnet from him. M. Volpicelli, however, was convinced that the nervous disturbance was brought on by the sight of the magnet and not by magnetic action, and he was subsequently able to assure himself of the fact. The same person had to preside over a scientific meeting, and M. Volpicelli contrived to surround him with very powerful magnets, which were introduced into his chair, into the drawer of the table before him, and even under his feet, without his having the slightest suspicion of the trap laid for him. During the meeting, which lasted more than two hours, his nerves were not in the least affected; and when the meeting was over he declared, in answer to a question put to him by M. Volpicelli, that he was perfectly well; but when it came to his knowledge that he had been surrounded by powerful magnets he was extremely surprised and alarmed, and began to have an idea that he could not have been so well as he thought.

Oxygen in Opium Poisoning. — Dr. Farrington, in the *Medical Times*, describes a case in which, after the energetic use of coffee, atropia, artificial respiration, whiskey, and the galvanic battery, had each and all failed to restore consciousness, the administration of oxygen gas was followed by a gradual return of consciousness. Though the patient was attacked on the following day by double pneumonia, and ultimately died, the doctor says he is fully convinced of the value of this gas in cases of this sort.

Dr. Gaillard, commenting on the above in the *American Medical Weekly*, remarks: "We have seen the administration of oxygen to persons greatly intoxicated followed by the relief of all evidences, subjective or objective, of such intoxication. Several times we have been gratified at the ease with which oxygen removed the narcosis of chloroform or ether. This has been especially true of cases in which anæsthetics acted badly, and unpleasant heart or lung symptoms appeared."

Lime Vapor in Membranous Croup. — Dr. John Bartlett, in the *Chicago Medical Examiner*, recommends the following method of using lime vapor: The patient is placed in a tent extemporized with bedclothes and clothes-horse. In this is placed a tub, and in the tub a bucket, filled with hot water. Patient being seated in the tent with nurse, unslacked lime is dropped into the water. From time to time the physician estimates the state of the vapor, increasing the steam and lime by dropping into the water pieces of lime. The quantity of lime required is large. The doctor's experience in the use of this bath has been a happy one. The onward march of the disease seemed checked at once, and a real improvement to take place.

Nélaton's Treatment of Boils. — A French medical journal says that Nélaton for more than twenty years prescribed the use of alcohol for the prevention of these smaller abscesses which are so common amongst young people, and which so seriously impair the beauty of the face. It appears that this treatment is now extending, as some interesting details are to be found in a communication of M. Simon de Forges, of Sainte-Fourtaine, which appeared in the *Revue de Thérapeutique*. In speaking of boils, small outward abscesses, and other inflammations of the epidermis and of the derma, he observes that as soon as the characteristic circular redness appears on any part of the body, whatever may be its size, with a point rising in the middle, making it a grayish white, a thimbleful of camphorated alcohol should be poured into a saucer; the palm of the hand should be wetted with it, and this should be rubbed with gentle friction over the affected place. The fingers should be again steeped, and the friction continued as often as eight or ten times every half-minute. The place should be well dried, and before covering it up a little camphorated olive oil should be applied to prevent the evaporation of the fluid.

Remarkable Coincidences. — One of the most remarkable series of coincidences on record is furnished by the statistics of Iowa and Georgia in the matters of insanity, blindness, etc. The populations are given as follows: Georgia, 1,185,000; Iowa, 1,182,933 (the national census made them 1,191,792 and 1,184,109 respectively), and the following were the showings of the two States as to their unfortunate classes: —

	Georgia.	Iowa.
Insane	1185	1183
Idiotic	790	789
Deaf and Dumb	677	676
Blind	474	473

CHLORALIANA.

Hydrate of Chloral for Venous Injection as an Anæsthetic. — Dr. Oré, of Bordeaux, has addressed a communication to the Société de la Chirurgie on the injection of chloral into the venous circulation. He has gone so far as from two to six grammes. He believes there is no other anæsthetic so potent. The insensibility in the animals thus operated upon was so great that the electric current alone interrupted it. In a case of tetanus occasioned by the contusion of the left middle finger, he injected twice, at an interval of some minutes, nine grammes of chloral dissolved in ten grammes of water. At the second injection the sufferer fell into a deep slumber, the breathing became calm and regular, the pulse was 70, and the insensibility so complete that the nail of the bruised finger could be avulsed without a trace of suffering. Next day the injection was repeated, and by the third day the severity of the malady was much abated. M. Verneuil witnessed five recoveries in tetanus by the employment of venous injections of chloral, and M. Boinet two. Should this remedy be equally successful in other cases it would prove an infinitely desirable innovation in regard to the treatment of tetanus, commonly so intractable.

Chloral and Bromide of Potassium in Chest-Affections. — Dr. S. L. Abbott, of Boston, in a communication to the *Philadelphia Medical Times*, says: "With regard to the use of chloral and bromide of potassium together as a sedative in cases of chest-affection, I would say that I have repeatedly used this combination, and I dare say it has occurred to many others to employ it. During the present autumn, some of my patients who are victims of 'autumnal catarrh' have found great comfort from it. The addition of a little morphia adds to its efficacy, and in one instance at least, that of a lady who is very susceptible to the disagreeable after-effects which opiates so often produce, the chloral and bromide seem to prevent their occurrence entirely."

SELECT FORMULÆ.

Remedy for Toothache. — The *Dental Cosmos* gives the following formula: —

Carbolic acid, saturated solution,	
Hydrate of chloral, saturated solution,	
Camphorated tincture of opium,	
Fluid extract of aconite	āā fl. ʒj.
Oil of peppermint	fl. ʒss. M.

Antispasmodic Pills. — The *London Medical Record* gives the following formula: —

Pulv. assafœtidæ,	
Pulv. camphoræ,	āā ʒvj.
Ext. belladonnæ	℈ii.
Pulv. opii	℈i.
Syrupi	q. s.

M. Ft. in pil. No. clxxx.

One to be taken the first day, two the second, and so on until six are taken daily, or two three times a day. Useful in hysterical and spasmodic nervous affections, in connection with bromide of potassium in doses of ten to fifteen grains.

Apply by saturating a pledget of cotton (or preferably a small piece of sponge), and pack closely into the cavity of the decayed tooth.

Milk of Almonds. — The *Druggist's Circular* gives the following recipe: —

Blanched sweet almonds	1 ounce.
Best glycerine	1 "
Distilled water	½ pint.

Beat the almonds to a smooth paste. Mix the glycerine and water, and then add them very carefully to the paste, triturating all the time.

Another Method of Making Cod-Liver Oil Palatable. — Mr. P. L. Simmonds, in the London *Chemist and Druggist*, suggests the following: Take equal parts of ground coffee and bone black; mix them in ten times their combined weight of cod-liver oil, and digest for half an hour at a temperature of about 130° Fahr.; then place the mass on a filter and drain the oil off, and you will have its nauseous taste changed into a pleasant coffee flavor.

Messrs. Editors, — Your last number contained an article entitled, "Treatment of Pneumonia and Bronchitis by Carbolic Acid." I send you the following prescription for the same purposes, which I have employed for twenty years with almost unvarying success, and which is free from the disagreeableness of the carbolic acid used in the former. The carbolic acid has no special properties rendering it useful in the cases proposed, and the following has the active ingredient contained in the former in about the same proportion: —

Tinct. opii	ʒj.
Spt. etheris nitrici	ʒss.
Syr. ipecac.	ʒij.
Ol. gaultheriæ	gtt. v.
Syr. simp.	ʒijss.

M. Dose, teaspoonful every four hours for adult, or as case may require. H. R. R., M. D.

FACETIÆ.

A Darwinian Plea. — A Darwin philosopher was brought before a justice on a charge of drunkenness. In defence, he said, "Your worship, I am a Darwinian, and I have, I think, discovered the origin of my unfortunate tendency. One of my remotest grandfathers was an anthropoid of a curious turn of mind. One morning, about 4,391,633 B. C., he was looking over his store of cocoa-nuts, when he picked up one for his breakfast in which the milk had fermented. He drank the liquor and got gloriously drunk, and ever after he always kept his cocoa-nuts until fermentation took place. Judge, then, whether a tendency handed down through innumerable ancestors should not be taken in my defence." Casting a sarcastic look at the prisoner, the justice said, "I am sorry that the peculiar arrangement of the atoms of star-dust resulted in giving me a disposition to sentence you to pay a fine of five shillings and costs."

Good Advice to a Dyspeptic. — A gentleman saw an advertisement that a receipt for the cure of dyspepsia might be had by sending two postage stamps to the advertiser, and the answer was, "Dig in your garden and let whiskey alone."

Boston Journal of Chemistry.

VOLUME IX. BOSTON, JANUARY, 1875. NUMBER 7.

Familiar Science.

OBSCURE FORCES IN NATURE.

THERE are very many apparently insignificant operations and processes in nature, concerning which but few stop to ask by what power the phenomena are brought about. The peculiar force or forces manifested by the surfaces of bodies are too singular to escape inquiry, and still more interesting and wonderful is the attractive force present in the interior or molecular interstices of bodies. If we place a drop of water upon a dry, highly polished strip of plate-glass, and invert this, the drop does not fall off; and if we bring another strip in near contact with the one holding the water, it is at once lifted against the gravitating influence of the whole earth. These experiments inform us that a power resides on those glass surfaces of no inferior importance; indeed, we know that it is a power equal to the breaking up of strong chemical affinities. This is proved by substituting for the drop of clear water a drop of solution of copper or zinc, when it will be found that the metal is gradually separated from the solution and deposited in thin films upon the glass plates. In the fine fissures of greenstone rocks we often find films of native copper, and the films of gold in the cracks of the gold-bearing quartz are well known to the miner. These are doubtless due to the force resident on the surfaces of the rocks, in the same way as is shown in action by experiment.

A lump of sugar, placed in a saucer with a little water, will in a few moments attract to itself the water, drawing it up against the powerful attraction of gravitation and hiding it in the interstices between the molecules. A bit of sponge accomplishes the same work much more rapidly and perfectly, the little tubes "sucking up" the liquid instantly. If we take a piece of lamp wicking, or a strip of calico a foot long, and after wetting it thoroughly hang it over the edge of a basin of water, the water will ascend through the cotton, and mount over the side of the vessel, and soon the basin will be empty. These are apparently simple things to observe, but they open a door disclosing a way which promises to lead us to a knowledge of nature's most secret operations.

Suppose we are at the sea-shore, where the waves beat upon the strand; a vast ocean of saline water stretches before us. This water we cannot drink, as it holds in solution certain salts which render it very bitter and injurious to the system. If we make an excavation in the sand fifty or a hundred feet from the flow of the tide, and reach water, we shall find it to be perfectly fresh and palatable. Here we observe the influence of surface: salt water, when filtered through thirty feet of silicious sand or powdered glass, is rendered free from salt, the surfaces of the grains of sand attracting and holding fast the saline particles. This is indeed a wonderful result, and well worthy of attention.

When water colored by organic matter is filtered through a few feet of earth, the coloring matter is removed, and the water flows clear as crystal. The surfaces of the earthy particles attract and hold the coloring principle with a firm grasp. Charcoal possesses this power of surface attraction more strikingly than any other substance, and hence it is used for purifying water, decolorizing syrups, etc. It also has the power of absorbing gases and vapors, and hiding them away in great quantities. A cubic foot of fresh charcoal will absorb more than thirty feet of certain gases. If a bit of charcoal connected with a voltaic battery is plunged into a solution of platinum, in a few hours it will have all of its interstitial spaces coated with a film of the metal. This platinized charcoal possesses all the powers of ordinary charcoal greatly exalted. It acts, indeed, as spongy platinum does, and not only condenses the gases escaping from putrid matter, but combines them with oxygen and slowly burns them away. A jet of hydrogen projected upon spongy platinum is rapidly condensed, and forced into combination with oxygen, so that heat enough is developed to ignite the hydrogen. That this is produced by surface action is proved by experiment. Take a piece of perfectly clean platinum and plunge it into a mixture of oxygen and hydrogen gases; a film of water will form on the surface of the metal, and by the heat evolved in this process the metal will become red-hot.

But few, probably, ever reflect upon the question of what becomes of a lump of sugar when dissolved in a cup of tea. A substance having the physical characteristics of a dry, powdery body is put into the warm liquid and it suddenly disappears; we cannot see it after solution has occurred, and we can only know of its presence by the sense of taste. How is it so mysteriously concealed from view? A little attentive consideration will carry conviction to the mind that in the solution of the sugar in water we see the diffusion of it through the interstitial spaces of the fluid, up to the point of saturation, when the solvent power ceases. The process is similar in nature to the solution of sulphuretted hydrogen in charcoal; it is another mode in which substances manifest surface force. This surface force in water may be beautifully shown by experiment.

If to a solution of sulphate of copper some liquid ammonia is added, we produce that beautiful purple solution which marks the shop of the druggist. Fill a small phial with this solution, and, placing a little bit of window-glass over its mouth, lower the phial, by means of a string into a confectioner's jar filled with water. When it rests steadily at the bottom of the jar, strike off carefully with a rod the glass cover from the phial. The water and the ammonia-sulphate of copper are in contact, but they do not mix. Gradually it will be observed that the purple solution loses color, becoming a pale blue. The chemical combination has been *overthrown;* the ammonia has left the sulphate of copper and diffused itself through the water. Here is a manifestation of power in a quiet way which cannot but fill us with wonder.

It is probable that the phenomena called exosmose and endosmose are a similar action of forces. When a piece of animal membrane divides two fluids differing but slightly in their character — say, for example, syrup on one side, and water on the other — porosity immediately begins its work; the solid substance in solution (sugar) passes through in one direction, while water passes through in the other. Flowing in and flowing out goes on until all the sugar leaves its own cell, and settles itself in the other. By this wonderful process numerous chemical decompositions can be effected, requiring the aid of the most energetic forces.

In each and all of these phenomena, it is tolerably certain that we are dealing with an obscure but a most energetic force, possessing more resemblance to gravitation than to any other known power, but distinguished from it by broad lines of difference. In gravitation we discover a power acting irresistibly amongst the particles of matter, drawing all to a mathematical centre, while at the same time we detect an influence — is it diffusive? — which binds mass to mass in space, and regulates the motions of worlds. In the surface force we find a power acting in perfect independence of gravitation, often in opposition to it; but it is a prisoned giant, whose power is limited to the cave in which it dwells.

THERMOMETERS AND HYGROMETERS.

IN one of these familiar science papers, which appeared in the JOURNAL for July, 1873, we gave the history and construction of the ordinary mercurial thermometer, and explained the different "scales" or modes of graduating it which are used in this country and in Europe. We intimated that we might in another article take up some of the other forms of the thermometer, chiefly used for scientific purposes. A few of these, with some kindred instruments, will furnish our subject now.

As mercury freezes at —38° F. and boils at 576° F., it cannot be employed for the marking of temperatures beyond those extremes. For lower degrees of cold, like those of polar regions, alcohol thermometers are commonly used. They are not so accurate as mercurial ones, on account of the volatility of the alcohol and for other reasons which it is hardly worth while to consider here, and therefore the mean of the markings of a dozen or more instruments is usually taken, in cases where accuracy is desirable.

For temperatures above the boiling point of

mercury, within a certain range, metallic thermometers are the most trustworthy. Of these there are various forms, of which Bréguet's is one of the best, and may be taken as a sample.

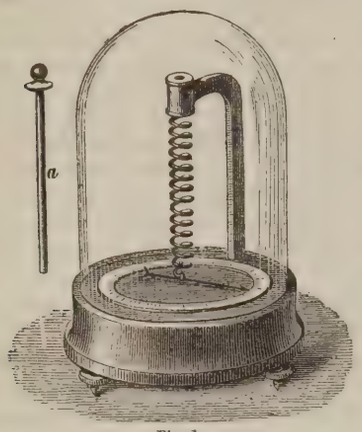


Fig. 1.

This instrument, shown in Figure 1, consists of a thin spiral ribbon, composed of strips of silver, gold, and platinum rolled together. The silver, which is the most expansible, is placed on the inner side of the coil; the platinum, which is the least expansible, on the outside; and the gold serves to connect the two. On account of this unequal expansion, the ribbon becomes coiled or uncoiled with a very slight change of temperature. A needle attached to one end of the coil moves over a graduated scale. The rod *a* is put in the axis of the spiral to keep it in place.

For very high temperatures, like those of furnaces, what are called pyrometers (literally *fire*-measurers, as thermometers are *heat*-measurers) are sometimes employed. Wedgwood's pyrometer, invented by the famous potter, consists of a gauge for measuring the contraction in a piece of baked clay placed in the furnace or fire whose heat it is desired to ascertain. In Brongniart's an iron bar is placed in a groove in a porcelain slab, with one end against the end of the groove and the other projecting through the side of the furnace, where it moves an index. But neither of these pyrometers, nor any other of the kind, has been found to give consistent results, and the only instrument that is now relied upon for measuring very high temperatures is the air thermometer, which, as we remarked in the article alluded to above, was the first form of thermometer constructed.

Differential thermometers, so-called, are employed to show the difference in temperature between two neighboring places or substances. An ingenious yet very simple instrument of this kind was invented by Dr. Leslie, of Edinburgh, and bears his name. It is represented in Figure 2, and consists of two bulbs, filled with air, connected by a bent tube, the lower part of which contains sulphuric acid colored red, or some other liquid that is not volatile nor easily frozen. While both bulbs remain of the same temperature, the liquid rises to the same height (as to C and D in the figure); but if *A* becomes warmer than *B* the air in it expands and pushes down the column at *C*, and causes it to rise at *D*. It is an exceedingly sensitive instrument, and with its aid Leslie made some very delicate investigations on the radiation of heat.

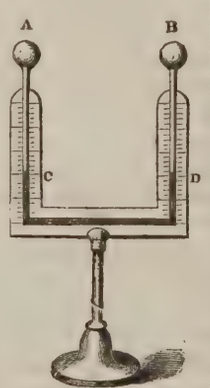


Fig. 2.

A far more sensitive differential thermometer, and one which has now superseded Leslie's for all nice scientific work, is the thermopile, or thermo-electric battery, of which we gave a description in the JOURNAL some five years ago. It is based on the simple principle that when pieces of any two metals are brought in contact, and the point of junction either heated or cooled, a current of electricity flows from one to the other. A combination of many pairs of such metallic bars (bismuth and antimony being usually employed for the purpose) forms a thermopile. If one face of this pile be heated or cooled in the slightest degree more than the other, an electric current is started, which can be measured by a delicate galvanometer. A difference in temperature of less than the thousandth of a degree of the Fahrenheit scale may thus be detected and registered. The warmth of the hand at a distance of several feet from one face of the pile will deflect the needle of the galvanometer, while a small piece of ice held at the same distance will cause the needle to swing in the opposite direction.

It was by means of this instrument that Huggins established the fact that heat is a constituent of the stellar rays. The star Regulus, which is so far away from our earth that its light, flying at the rate of 190,000 miles in a second, takes *twenty-six years* to reach us, was one of those upon which he experimented with successful results. The rays of heat which fell from that star upon the face of the thermopile, excited the electric current in its network of metallic bars, and swerved the needle of the galvanometer, started from their stellar home twenty-six years before. Verily, truth is stranger than fiction, and the sober realities of science more wonderful than Arabian tales of magic.

Many forms of "self-registering" or "maximum and minimum" thermometers have been devised, which mark the highest and lowest temperatures that have occurred during a given interval. In most of these instruments, which are mainly used for meteorological purposes, a movable button or index within the tube is so constructed that it is left at the highest or lowest point reached by the mercury or alcohol. In some there is a single thermometer with two indexes of different shape; but more commonly there are two thermometers, often placed horizontally, one of which records the maximum and the other the minimum temperature. The best instrument, however, for this purpose is the thermograph, which furnishes a photographic record of the height of the mercury, not merely at its extreme points, but for every instant during the day. We cannot take the space to describe the apparatus minutely, but it is essentially an arrangement for photographing the mercurial column, or rather the transparent portion of the tube above it, on a sheet of sensitized paper which revolves on a cylinder behind the tube, and is protected from all light except that which comes through the tube. If the mercury rises, cutting off more of the light, the photographically affected band on the paper will be narrowed; if the mercury falls, that discolored band will be broadened; and as the paper is moved with perfect regularity by clock-work, the curved line bounding the band shows the temperature at each instant of the twenty-four hours. The light used is that of a lamp or gas flame concentrated on the tube by a lens.

Hygrometers are instruments for indicating the condition of the air with regard to moisture, and as the best forms are applications of the thermometer, we will refer to them briefly here.

Daniell's hygrometer, shown in Figure 3, consists of two glass bulbs, one of which is half filled with ether. The rest of the space is occupied with the vapor of ether, the air having been expelled. The bulb *B* is covered with muslin, which is moistened with ether. The evaporation of this ether produces intense cold, causing a rapid condensation of the ether vapor inside *B*, and indirectly as rapid an evaporation of the ether in *A*, which cools that bulb until the air in contact with it sinks below the dew-point. Dew is consequently deposited on the surface of *A*, which is made of black glass in order that the exact moment of the deposition may be readily observed. At this moment the temperature is read on the enclosed thermometer. When the dew disappears with the rise of temperature, the same thermometer is also read, and the mean of these two readings is taken to indicate the dew-point. The thermometer *C* gives the temperature of the air.

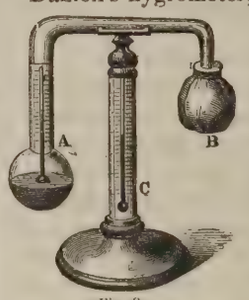


Fig. 3.

Mason's hygrometer (Figure 4) consists of two thermometers placed side by side, one having a dry bulb and the other a bulb covered with muslin, kept moist by means of a string dipping in water. The wet bulb is chilled by the evaporation of the water from it, since this evaporation renders some of its heat latent. The drier the air, the more rapid the evaporation, and the greater the difference between the readings of the wet and dry bulb thermometers.

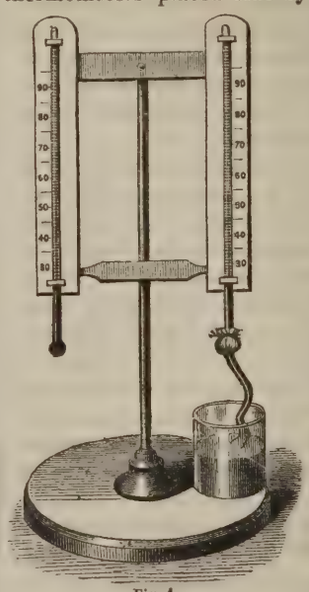


Fig. 4.

Edson's hygrodeik is an improved form of Mason's hygrometer, having between the two thermometers a dial, over which a pointer moves, showing at a glance the temperature, the degree of humidity, the absolute amount of vapor in each cubic foot of air, and the dew-point.

OXYGEN, A CHEMICAL COQUETTE.

ON the first day of August, in Northumberland, Penn., was celebrated the centennial of our first acquaintance with the distinguished personage who is the heroine of this story. She had been a prominent actress in the dramas and tragedies of material existence from the earliest history of the earth. Yet till her formal introduction

by Mr. Priestley, a hundred years ago, she had successfully escaped the observation of men. This elusion, however, was not from modesty, for no one is more bold and brazen-faced than she. Had she been asked, as was Job, "Where wast thou when I laid the foundation of the earth?" she could have answered, "Present," instead of acknowledging ignorance, as did the patient man by his silence.

In the chemical world there are only a little more than sixty distinct individuals, called elements. Of these our heroine is the acknowledged leader, and is by far the most important of all. But it must be confessed that she has a great deal of human nature. Knowing her importance, like many of her sex she becomes vain, and must now be branded as an incorrigible coquette. And it shall be a part of the object of this article to expose her in some of the erratic games she has played upon her admirers. She has captivated every known individual of her nationality, with a single exception [Fluorine]; but this discreet character has shown no susceptibility to her most fascinating charms. It seems to make but little difference whether the object of her affections be male or female. In fact, the one in whose society she is most generally found has given investigators and writers on this race of entities considerable doubt as to which sex it belongs to, manifesting as it does the qualities of each. Her love for this individual, Hydrogen, is not so strong as for some others, yet while they are near each other, only the slightest spark is necessary to kindle their mutual love into a mighty flame which burns with irresistible ardor [oxyhydrogen blowpipe] during the short honeymoon, then cools down and becomes as placid as the smooth surface of a tranquil lake, and often as cold and undemonstrative as an iceberg. In this quiet and contented state they will frequently remain for an indefinite length of time, perfectly happy in each other's society; sometimes, indeed, overwhelmed by the deep waters, then on the topmost wave of prosperity and delight, and again building beautiful air-castles and painting gorgeous scenery among the clouds.

This state of things continues as long as other suitors entirely refrain from interference with this seemingly contented pair. But if any one of several individuals of the sterner sex puts in an appearance, our coquette at once manifests her characteristic fickleness and runs madly after the new-comer. When Mr. Sodium presents himself, she flies from her old mate to the intruder with a glowing flame of love. For Mr. Potassium she has a still more ardent affection. In these cases, Miss Oxygen deserts her former companion, who is either consumed in the flame of the new affection or taken back as second choice by this insatiate heart-breaker. For Mr. Zinc, who has some of the most marked elements of brassiness, she has a very strong attachment when once in his society. So she has for Mr. Ferrum, of Iron Mountain, Mo. But she seldom takes to either of these in cool, dry weather till she has in some way been soured [acidified] in her disposition, or had her ardor cooled by a copious water-bath. But a similar effect is often produced when the temperature is considerably elevated. This seems also to increase her liking for a large number of suitors of the ruder sex who are more or less distinguished in the chemical world.

In her acquaintance with Miss Nitrogen she betrays the greatest inconstancy, and their intimacy seems to produce a wonderful effect upon the character of both. This effect very perceptibly varies with the closeness of their intimacy. Sometimes it makes them extremely sour in their disposition [nitric acid], corroding and destroying everything they touch; again, it has at times the very opposite effect of making uncontrollably gay and happy any person who comes under their influence [laughing gas], or it overwhelms him with a drowsy stupor which is of short duration. But be it said just here, to the credit of Miss O., that of the sourness of temper that has so long been charged upon her as the cause, she is entirely innocent. The really responsible party is her old flame, Hydrogen. While seemingly contented with the society of Miss N., she will suddenly take unceremonious leave on the first approach of another suitor, and sometimes when she is influenced by nothing more than a simple breath of air. These two individuals have a more distant phase of acquaintance [common air] in which they seem to agree to disagree: constantly jostling each other; wafted together, now on the zephyr, now on the tornado; driven to the tropics and to the poles, out on the trackless ocean or aloft upon the crags of the bleak mountain-tops. Though companions in all these vicissitudes, they manifest no special like or dislike for each other; and while in this condition, nothing less than a flash of lightning can induce them to a closer sympathy, and this only at the expense of their sweetness of temper [forming aqua-fortis].

Miss Carbon is black as a coal, as she is commonly seen, though she at times appears brilliant and transparent as the diamond. Yet, strange as it may seem, Miss O., who herself is light and gay as the air, is most easily induced to accept the company of Miss C. when the latter assumes her sable robes. Then the latter is transformed from her massive blackness to the comely transparency and sprightliness of her friend, though a little more sluggish in her movements. By their attachment is formed an atmosphere of death [carbonic oxide or acid], which always emanates from their affection. Miss Oxygen does not care for this friend except in very warm weather, and hence might be called a summer friend; yet, when the intimacy is once formed, it can be broken off only with the greatest difficulty. The severest intensity of winter cold *then* can only make it the stronger. No changes of season or place — not the mightiest commotions in nature — can make any change in their minds. Yet the tenderest leaf, with a gentle ray of the sun, can easily and effectually divorce them.

We have represented our heroine as fickle and trifling in her temperament, but would not be understood as conveying the impression that she is entirely worthless. She is by no means without redeeming qualities. As a rule, she chooses the poor and undistinguished for her associates, in preference to the wealthy and aristocratic. Messrs. Aurum, Platinum, and Argentum, and Miss Diamond Carbon, who are all very opulent and genteel, have the greatest difficulty in inducing her to take even the slightest notice of them; while Hydrogen, Ferrum, and others of poor but respectable parentage, are her chosen friends. Although she has time to make such havoc among the hearts of her lovers, she is withal a model of neatness and a genuine philanthropist. She does more than all the boards of health to purify the air of noxious effluvia and to remove all matter from which it can emanate; and does more than all social reformers to destroy corruption and defilement in every grade of society. Again, she is a practical temperance reformer, for she is constantly exerting herself, as she has opportunity, to transform destructive alcohol into useful and harmless vinegar [acetic fermentation]. In short, she is of more benefit to us than any other individual of her race.

THE SCIENCE OF ADULTERATION.

BY S. P. SHARPLES, STATE ASSAYER.

II.

ANOTHER article for the adulteration of cream of tartar is coming into use, that is, rice-flour; and some of the wholesale grocers are selling two grades, one pure and the other adulterated with this material. It is rather more difficult to detect than gypsum. It may be detected by dissolving the cream of tartar in cold water, adding sufficient baking soda to neutralize the acid. The solution is then allowed to stand until the starch settles to the bottom. This may be examined under the microscope for starch grains. These, in the case of rice, are small and have sharp angles; they are very characteristic. The precipitate may also be dissolved in hot water, which distinguishes it from gypsum; the solution when cooled gives the customary reaction with iodine. The success of this adulteration lies in the fact that the flour is almost completely soluble in hot water, or, at most, only imparts a slight milkiness to the fluid.

Coffee is a favorite article for the manipulations of the sophisticator. It may be laid down as an almost universal rule that none of the preparations nicely ground and packed in pound papers are genuine. The price alone will show this; they are all sold for less than the unroasted berry.

The ground coffee sold in bulk by the grocers is a little better in quality than the above, but generally consists of a cheap grade of coffee, and is often quite largely mixed with ground beans. The detection of these mixtures is very easy. Genuine roasted and ground coffee will float upon the surface of water, while beans, peas, and such articles at once sink to the bottom. Peas, beans, burnt sugar, etc., impart their color much more quickly to water than genuine coffee does. The burnt unground coffee is generally pure coffee, although it may be of a very low grade.

If any one really likes coffee, and does not drink it, as many seem to do, merely because they wish some warm beverage, the best way is to buy the raw berries and roast them at home.

Coffee, to be first-class, should always be put into a tight tin can after roasting, before it has had time to cool, and only ground as wanted for use. If, however, people will insist upon having coffee substitutes, sweet potatoes, dried and then browned as coffee is roasted, make one of the best substitutes.

The sophistications practised in regard to tea are the substitution of leaves of other plants for tea leaves, and the occasional mixture of dried spent leaves with fresh ones. This last trick, however, is almost too much trouble. The most common fraud is the change of brand. This is

done by buying up old chests bearing a choice mark and filling them with an inferior tea of the same general appearance. This is a fraud that no one but a tea expert can detect, more especially after the box has been opened the second time. The tests given in works upon adulteration, which may serve very well to detect such frauds as facing, the mixture of other leaves and sand, iron filings, and dirt in general, are powerless against this sophistication.

FAMILIAR SCIENCE NOTES.

Making Coffee. — We referred in the last number of the Journal to a method of making coffee intended to secure both the aroma and the nutritive matter of the berry. We learn from the *Causeries Scientifiques* that M. Doyen has been investigating the subject, and has proposed the following method for attaining the same end. He uses 15 grammes (or about half an ounce avoirdupois) for two cups. The berries are to be powdered just before they are used. Three fourths of the powder is thrown into cold water, which is made to boil, and kept boiling for ten minutes. Then the remaining fourth of the powder is cast in; the pot is removed from the fire, covered up, and allowed to remain five minutes. The liquid is now ready; but it may, if desired, be passed through linen. So prepared it is brownish, not black, and slightly turbid from the fatty matter, of which coffee contains 12 per cent. When coffee has to be carried on a journey, as by an army on the march, M. Doyen has the roasted berries ground into an impalpable powder, which is then slightly moistened, combined with twice its weight of sugar, and pressed into tablets like chocolate. These are dried and wrapped in tinfoil, and the coffee ration thus prepared may be used very speedily; for if cast into boiling water the coffee is ready. Precious time and the necessity of having coffee-mills are thus saved.

Daylight Reflectors. — By means of reflection much additional light may be thrown into a window, especially in narrow streets, where no direct skylight can fall upon the windows. If, however, the surrounding walls are kept of a light color, almost as much light can be admitted as if there were no obstructions and the windows were open to the sky. The law of the reflection of light is that the incident ray which falls upon any bright surface makes with the perpendicular to the surface at the point of incident the same angle that the reflected ray makes. If, then, we place a plane reflector outside a window at an angle of 45° to the horizon, so as to allow the light from the sky to fall upon it, the rays will enter the window horizontally; or, if placed at 60° with the horizon, the reflected rays will enter the window at an angle of 30° to the horizon: so that by regulating the position of the reflector, the light may be thrown into the window in any direction that may be required, and as much light can thereby be brought into a dark room as would be obtained from a small skylight.

Improved Metallic Crows' Nests. — The substitution of metallic for vegetable substances in constructive works has been going on among mankind for a considerable time and with accelerative force, and the movement appears at last to have spread to the lower animals, as, at the March meeting of the Asiatic Society of Bengal, a crow's nest was exhibited, which was constructed of pieces of thin telegraph wire, very ingeniously interwoven, and it was stated that similar nests, and others made of soda-water-bottle wire, were not uncommon in the vicinity of the telegraph store yard. The English journal *Iron* is our authority for this bit of Oriental news.

Practical Chemistry and the Arts.

ENGLISH AND AMERICAN IRON STEAMSHIPS.

While our English cousins are lengthening and narrowing their ocean steamers, they are making them of poorer and poorer iron. It is a notorious fact that when one of these vessels has to be repaired in this country (as in the case of a White Star ship recently damaged by collision with the Parthia, in New York harbor), the quality of the iron used in her construction is found to be much inferior to our own. The great iron ships built at Chester, Pa., of which the City of Peking and City of Tokio are the noblest examples, have cost a little more than they would on the Clyde, but if the quality of the iron is taken into account, they are really cheaper than vessels of foreign build.

That this is not mere Yankee boasting is proved by the fact that English critics are lamenting the unseaworthiness of their new iron ships. The following is from a recent number of *Iron*, the highest British authority on the subject: —

"Some of the more recently-built steamships appear to be turning out indifferently. During the late gales one of them, the Chusan, quivered and strained so convulsively that her officers refused to proceed in her; so she was put about with her head towards the Clyde, and, touching a rock, she perished while attempting to escape destruction. Another broke clean in two in mid-sea — snapped like a thing of glass or earthenware, from sheer excess of weakness. A third steamer, name as yet unknown, opened, and liberated her deck, which was lately seen floating entire on the water, with the wings of the paddle-boxes attached to it. Early this year a little fleet of clippers, outward bound, lost their masts, and in each case the brittle masts were of the new kind — tubes of iron. Underwriters were made uneasy as the tidings came in of one fine ship after another having had her masts snapped like carrots, nor did they feel at all reassured when it transpired that in more than one instance the masts had gone over the side when there was no special stress of weather to account for their sudden failure. Iron ships used not to break in two when afloat, nor used iron masts to go like glass rods, as of late some seem to have done. There is deterioration somewhere. Is it in the material?"

TAPIOCA.

This elegant and delicate starch is the product of a plant that is cultivated very extensively in the Malay Peninsula, where its culture is almost entirely in the hands of the Chinese. The tubers of the plant (*Manihot utilissima*), which weigh on an average from ten to twenty-five pounds, are first scraped and then carefully washed; after which they are reduced to a pulp by being passed between rollers. This pulp is carefully washed and shaken up with abundance of water, until the fecula separates and passes through a very fine sieve into a tub placed beneath. The flour so obtained is repeatedly washed, and then placed on mats and bleached by exposure to the sun and air. It is finally converted into the pearl tapioca of commerce by being placed in a cradle-shaped frame covered with canvas; it is slightly moistened and subjected to a rotary motion, by which means it is granulated. It is next dried in the sun, and finally over the fire in an iron pan greased with vegetable tallow, and is then ready for the market. S.

MEMORANDA IN THE ARTS.

New Decorative Processes. — Dr. Kosch, of the Chemical and Technological School at Vienna, has made the important discovery that certain colors may be made fire-proof, and may thus be used for painting on china in precisely the tones required. He has prepared a palette on which his colored enamels may be used like ordinary oil-colors, and may be painted in every conceivable combination of tints without being in the slightest way altered by the action of fire. At the same time he makes use of a specially prepared enamel, which he spreads over the surface to be painted on, and by which the irregularities and porosities of the porcelain are as thoroughly concealed from view as if they were covered with thin, smooth fine linen. The importance of such a surface-medium will be fully understood by all who are practically conversant with the difficulty of preventing the irregular and undue absorption of color, which has hitherto stood in the way of producing artistic and carefully-toned effects of color on porcelain.

Another interesting invention for which decorative art is indebted to Dr. Kosch is the fusion of gold, silver, and platinum with bronze, by which the most gorgeous effects are produced; gold fusion giving to the metal a splendid violet tint, silver a faintly-lustrous "Kioto" tone, and platinum a rich and deep black shade. The intermediate tints may be obtained by modifications of heat, while the same process may be applied with nearly equal success for cast iron. Dr. Kosch has succeeded in producing very novel effects by laying on one tone upon the other, as, for instance, colored leaves and variegated arabesques on differently-tinted metallic surfaces; and his method is beginning to be extended to the ornamentation of leather, thus bidding fair to revive, at a moderate cost, the art of preparing leather mosaics, which owed its origin to Grolier, and is one of the most elegant of the numerous artistic adaptations of inexpensive materials to artistic purposes for which the sixteenth century was distinguished.

Animals as Motors. — M. Marey, to whose work on "Animal Mechanism" we alluded last month, has laid before the French Association for the Advancement of Science some interesting observations on the employment of animals as motor powers. He proves by means of very elaborate instrument that the movement of animated beings as motor powers takes place by jerks, whence result shocks, and consequently a waste of labor. As an illustration of this theory, M. Marey cites the effort necessary to draw a burden behind one. If the necessary force be transmitted by means of a rigid or almost unextensible strap, for instance, of leather, the movement is jerky and more difficult than if it were transmitted by an elastic strap. It would therefore be better to attach horses to the shafts with india-rubber traces. He also gives as an illustration the manner in which boats are always dragged along the towing-paths by long ropes. It would be impossible, or at least very distressing, to employ short ones. The length of the rope, which alternately tightens or slackens by slow oscillations, has in this case the same effect as india-rubber.

New Process for the Preservation of Wood. — According to Hatzfield, sulphate of copper gives imperfect and variable results, because of its solubility in water; and creosote does not fulfil all the necessary conditions, on account of its rarity and high price. He proposes ferrous acid-tannate. A number of observations he has made seem to show that the action of tannin on vegetable tissues is

similar to that which it exercises on animal tissues, causing a sort of tanning; the result is probably the formation of hard and imputrescible albuminous tannates, quite analogous to the gelatinous tannates produced in the tanning of skins. In support of this view he cites the clearing of wine by means of white of egg or of isinglass, the preservation of skins by the action of an infusion of oak bark, and the durability of wood rich in tannin, as oak and chestnut. Moreover, Hatzfield gives, by means of tannate of iron, a greater degree of hardness to soft woods, so as to be able to apply them to industrial purposes. This compound, which is soluble, is transformed under the influence of the air into an insoluble salt of an intense black color; it is deposited in the cells of the wood in a solid state, and produces a sort of petrifaction which augments the durability resulting from the action of tannic acid alone.

The Artifical Production of Vanilline. — At a recent meeting of the French Academy of Sciences, Dr. A. W. Hofmann stated that his two students, M.M. Tiemann and Haarmann, who had obtained vanilline (the aromatic principle of the vanilla bean) from pine sap, propose to manufacture this substance on a large scale. The sap of a tree of medium height gives vanilline to the value of 100 francs ($20), and the wood is not injured by the extraction of the sap. This will be the second vegetable product obtained by purely chemical methods, and its manufacture, like that of alizarine, is likely to be of considerable commercial importance.

Too Good to be True. — M. Paraf is said to be the discoverer of a way of doing without rain, if necessary. He knew that the air is full of moisture, and he knew that chloride of calcium would attract and condense it, for cultural purposes. He has applied this chloride on sand-hills and road-beds, on grass, on all sorts of soils, successfully, and he has ascertained that it may be applied in such proportions as will produce the irrigation of land more cheaply and efficiently than by means of canals or other methods of securing artificial irrigation. One of M. Paraf's applications will produce and retain abundant moisture for three days, when the same amount of water introduced by the present method will evaporate in an hour. He believes that his preparation will not only produce two blades of grass where but one now grows, but that it will render possible fields, meadows, and prosperity, where now there is nothing but sand and desert waste.

PRACTICAL RECIPES.

Black Enamel for Wood. — Prime the wood with linseed-oil, turpentine, and white lead; then give it two or three coats of black, mixed with copal varnish and turpentine. Rub it down when dry with pumice-stone and water; finally varnish with copal; again rub down and polish with oil and rotten-stone, to obtain a perfect smoothness.

To Dye Ivory Blue. — By keeping the ivory immersed in a dilute solution of sulphate of indigo, partly saturated with potash, for some time, a fine blue color will be given to it.

Improved Starch. — A beautiful finish can be given to articles to be starched by taking one fourth of a pound of starch, and working it over and kneading it with a little water, then placing five or six pints of water in a pan, and adding to this a very small quantity of powdered borax, a small piece of sugar, and a fragment of white wax about the size of a hazel nut, and heating the whole sufficiently. This water is then to be added to the starch, with continual stirring, mixing the two together until the whole is as thick as is convenient for application. If the articles are to be made quite stiff, the strength of the starch may be increased two or three fold.

Agriculture.

A NEW DISCOVERY.

New discoveries are constantly being made in every department of science and art, and therefore it is not surprising that in practical husbandry some new things should be brought to light. In some recent experiments conducted at the Treadwell Farm, a tract of land belonging to the Essex Agricultural Society, the rath r startling discovery is alleged to have been made, that the substances known as artificial fertilizers not only do not benefit crops, but seriously interfere with their success.

The experiments were made with potatoes, upon an acre of ground, and a dozen different kinds of fertilizing agents were employed, foreign and domestic, upon as many separate plats of the field. It was learned at harvest time that the plat upon which no fertilizing agent whatever was employed gave the largest yield of tubers. It should be stated that one plat was manured with barn-yard dung, but like all the other forms of plant food, this failed to carry the crop up to a level with that from the unmanured portion. This to many doubtless seems to be an extraordinary result, and we fear that some farmers who may chance to see the statement regarding the experiments will turn them to practical account, and henceforth trust to the unaided soil to grow their crops. The new discovery in its influence may thus cause disappointment and disaster.

After all, these are but oft-repeated experiments, and serve to teach some old lessons which by this time ought to be understood by intelligent farmers everywhere. They prove the unreliability of "one-year" experiments, conducted we do not care how, in so far as they are designed to show the value or influence of any fertilizing material. It is true, they show that for a single season, and under the conditions in which they were employed, the results were failures, but they do not show that those agents are valueless, or that artificial fertilizers should be discarded. We have made a large number of experiments with different fertilizing agents, under varying conditions of soil and seasons, during the past twelve years, and we have never published the results of any one-year experiments, unless with explanations, or with the view to explain some facts which such experiments alone could explain. It is no new discovery that artificial fertilizers fail sometimes to increase crops, or that they actually diminish them. The same is true of the influence of animal excrement. During the last decade we have applied fertilizing substances to fields for three successive years, and they gave us no returns; but these came at last. The next two or three seasons the field burdens were greater almost than could be conveniently carried. The pabulum was in the soil, and it only needed the action of earth solvents, heat or moisture, to place them in proper condition to be seized and assimilated by plants.

So much depends upon a proper supply of moisture and warmth, and so much depends upon the nature and condition of the soil where fertilizers are used, that no one can safely predict results in seed-time. Potatoes need special fertilization, unless upon fields which have not been much under the plough. During the past season, we had a patch of potatoes in a hill pasture, one half of which was well manured with stable dung, and the other half with a spoonful of gypsum placed in each hill. The latter gave much the better returns. Lime and potash supply to the potato crop needed elements of nutrition in our New England fields, and although their immediate effects may not be always observed, they can scarcely be ultimately lost. We have learned to sow the substances *known* to be adapted to the wants of plants, with the same degree of confidence that we sow the seed. Nature is true to herself, and her inflexible laws are never changed. Guided by experience and observation, and by a knowledge which chemical science imparts, mother earth can be nursed and sustained so that her gifts will be seldom withheld. We are, it is true, measurably in the dark upon several important points in practical husbandry, but in view of the past in agriculture the present is so much lighter that it seems like the full blaze of day. We must beware of the influence of superficial and ill-considered "experiments," so called, in husbandry. They do not often afford us desirable aid in conducting successfully field labors.

PROTECTING TREES FROM MICE.

Since the sad havoc made by mice in our apple and pear orchards several years ago, we have adopted the plan of placing around each tree a covering of tarred paper, late in the autumn. This has proved entirely successful, and as it costs but little for material or labor, we venture to recommend it. The cylinder of paper should be brought close to the ground, and extend high enough to protect the tree for a foot or more above, and the cord holding it in place should be securely tied without a loop knot. Trees that are liable to be covered by deep snows must be protected for more than one foot, as we have had trees from which the bark was gnawed *three feet* above the ground, not only the trunk being denuded but many of the limbs. Mice attack almost every kind of bush, shrub, and tree. The bitter barks of the peach and cherry appear to be fully as acceptable as those of the pear or plum. Where mice prevail, it will not do to depend upon any of the usual expedients, such as banking trees with earth or manure, or treading down the snow in winter. Reliance upon these has cost us more than one hundred of our choicest fruit trees. The tarred paper coverings must be renewed fresh each year, as they become so tender or brittle that they cannot well be used a second time.

COVERING STRAWBERRY BEDS.

In covering strawberry beds there is great danger of using too much material in the work. The plants are quite hardy and bear cold well, but in our rigorous climate need some protection. If too heavy or close protection is given, they undergo a kind of fermentation, and vitality is destroyed. In our experience, leaves, so highly recommended by some, have proved the very worst covering. They become wet, and matting down upon the plants are sure to destroy them. The green boughs of the pine and hemlock do exceedingly well, and are to be recommended when easily obtained. Coarse rye straw is upon the whole the best covering, and usually can be conveniently procured. It should not be placed on the beds so as to entirely hide

the plants, but enough provided to protect from heavy frosts in winter and hot suns in early spring, for the latter are quite as likely to injure the plants as the former.

TAKE CARE OF THE TOOLS.

The tools employed upon the farm are costly, and should receive the same care which is bestowed upon other valuable property. There is manifested by many farmers a kind of chronic neglect in respect to the care of the implements of husbandry. Complicated machines like those used for mowing, raking, threshing, etc., with their iron wheels, levers, and cams, are allowed to rust and decay, so that in a couple of seasons they are worthless. This neglect is inexcusable, unpardonable. Some farmers become torpid, frozen up, in winter, and appear to have no active blood in their veins. They will not take up a rake or a neglected hoe in winter and put it under cover. We have seen ladders, forks, harrows, shovels, etc., peeping out from under the snow in winter, in time of thaw, and have asked why they were not cared for. Sometimes the reply has been, "We will attend to it to-morrow," but that to-morrow never came. There must be a society organized for "protecting farming tools," and the officers must have full power to forcibly seize and put away all neglected implements, no matter upon whose premises they are found.

MEN AND ANIMALS.

The *New England Farmer* presents to its readers an abstract of the lecture of President Chadbourne, of Williams College, at the late meeting of the State Board of Agriculture, on the "Mental Faculties of Domestic Animals." It is exceedingly interesting, and gives what we believe to be correct views regarding the mental powers of animals: —

He takes the ground that animals have feelings that are common to man. The same physical laws govern both. If the animal is burned by fire, or is poisoned by arsenic, or is made sick and uncomfortable by any means whatever, the resulting pain is the same in each. The evidences of suffering are the same in both animals and man.

Fear affects the animal physically, as it does man. The pulsations of the heart are accelerated, and the whole physical system thrown into a state of trembling anxiety. The feelings of joy, hate, anger, love, and sorrow are manifested by both in the same manner. Animals also differ in their individual characters as much as men; or at least, the difference is of the same kind, if not equal in degree. Animals also learn by observation. Foxes learn how to prospect a trap-bed from the leeward side, and to remove the bait from beneath the trap without being caught, which proves that they can learn by experience. They soon become familiar with, and understand the tricks of the trapper, and on this account it is much more difficult to trap animals in an old settled country than in new territory. A story to the point was told of a dog that was in the habit of hanging around a butcher's stall, to the annoyance of the butcher. One day he charged a piece of meat with cayenne pepper and threw it to the dog, who swallowed it as usual, but when the pepper began to act he made all the motions of playing the jew's-harp with both paws, and ran from the store in agony. A few days after, he appeared again, and was offered another piece of meat, but with an angry look, a snap of the teeth, and a growl, he bade good-by to the butcher, who he had learned was a man not to be trusted. The case of the vicious mare that had been cured of biting the speaker by a severe whipping, and recognized her master years afterwards, just as she was going for him with open mouth, shows that animals not only learn by experience and by observation, but that they have the faculty of memory also, in common with man.

That hens can count is shown by the fact that if from a nest containing eight or ten eggs all are removed but one, they will usually desert the nest; but if three are left they will seldom do so, showing that, although they can count, they cannot count three. They can see the difference between one and eight or ten, but not between three and ten. So the cautious crow may be shot by taking advantage of his inability to count three. Build a hovel in the corn field, and go there with a gun, and the crows will give you a wide berth; they know a man with a gun is not good company. But let three men go to the hovel, and after a while two of them leave; the third man is enabled to shoot a crow, just because the bird has not learned to count high numbers. Animals have instinct, so has man. The scream of the hawk will send every chicken, however young, hiding away *from* its mother, at her note of warning. This is instinct, but the faculty of distinguishing between the flight of the hawk and that of the dove comes by observation.

Cows hide their calves in the woods, and from morning till night the calf will lie concealed, apparently with a perfect understanding of the compact which appears to exist between the mother and her offspring, necessary for its protection.

The dog, President Chadbourne believes, has more of the human in his constitution than any other animal. The elephant may have more, but he is not familiar with elephants. The dog certainly possesses true mental power, which is unlike instinct, as the latter is that faculty which acts naturally, and without being taught, and is common to the species, as is illustrated by the compact existing between the cow and her hidden calf, and by the acts of the calf in searching for its first food. Mental actions are such as enable the dog to understand his master when commanded to watch his property. Dogs not only understand words, but also a combination of words. The speaker illustrated this by a story of the dog that would join in a game of ball, and at the end of the game take the ball as his own trust and carry it to a place of safe-keeping, at the order of his master. Another dog, at the command of his master to go down the street some forty rods and run round a certain passing team, and come back upon the other side, did exactly as he was told to do. The shepherd dogs of Europe show great power of understanding and comprehending the full meaning of sentences, or of the combination of words. In illustration of the affection of the dog, it is sufficient to allude to the noble animal that for thirteen years lay on his master's grave, only leaving at a certain hour of each day to accept alms at the hand of a kind butcher. The manifestations of shame are the same, precisely, in the dog as in man. The same muscles play, and the same motions are produced. But study the dog and cat together, and a great difference is observed. A well-treated dog will allow himself to be punished by his master, but a cat never. Nor will cats watch property, but they readily learn to open doors, and this habit is in a measure transmitted. Cats are also capable of comprehending and of accepting a situation, as shown by the lecturer's own cat, who was carried to a neighbor's house to winter, while himself and family were at the city. It stayed contentedly all winter, hardly ever being known to leave the house, but was home again in the spring, within thirty minutes after the family returned.

Of the æsthetic power of animals, several fine illustrations were given, as of their apparent love of the beautiful in colors and in sounds. Every dog in the country knows perfectly the sound of the sleigh-bells belonging to the establishment. Of the origin of the faculty of instinct, the speaker hardly expressed a firm conviction, but gave the arguments of Darwin and others. He simply believes that instinct belongs to the animal, is a part of his organization, and that both organization and instinct are from the same source.

When our common hen has laid a nest full of eggs, she is said to commence sitting from instinct, but there are physical changes which also take place at this time. The feathers fall from the breast, and the heat is increased in the body. The fact that a hen will sit as well six weeks as three, interferes somewhat with the theory that instinct is the sole cause of this brooding condition. Then, at weaning time, instinct shows itself in a peculiar manner, as when the hen appears to hold a disgust of her young, and avoids them, except at night, when the maternal instinct returns for a few days. Whatever instinct may be, it is the same in man as in animals, and instinctive actions are inherited by both.

The trout in unfrequented streams are easily caught, but experience teaches them to fear and dread man. So the moral of the discussion is this: If feelings towards man are transmitted through generations of animals, it not only becomes our duty, but it is for our interest, to treat our domestic animals kindly. Breed from kind animals only, then treat them kindly, and great good will come of it. Animals have also rights which we are bound by the laws of humanity to respect. They have the right to good and wholesome food, comfortable shelter, and kind usage by their keepers.

THE OREGON MYRTLE-TREE.

Dr. F. S. Matteson, of Coos County, Oregon, sends us the following account of the myrtle-tree of that region: —

The myrtle is one of the most beautiful of trees. It grows from twenty to fifty feet high, and from six to twenty inches in diameter. Many specimens are larger. It is of very full foliage, with a leaf about three inches long by half as broad, of an ovoid-lanceolate form, not serrated, and of a deep shining green. It is an evergreen, and after the habit of its class sheds its leaves in summer. Before they fall, these old leaves turn a bright golden yellow, glistening in the sunlight and flecking the green foliage of the tree with golden spangles. The leaves are delightfully fragrant, and a ride through a grove of myrtles reminds one of the storied "odors of Araby," or the flower-perfumed "vale of Cashmere."

The wood is hard, heavy, fine-grained, and susceptible of receiving a high polish, and when thus finished, and varnished, is of a dark variegated color. It is useful for all the purposes for which walnut, mahogany, and other like woods are used, and is scarcely surpassed even by rosewood. The tree is very tenacious of life, sprouts freely from the stump after the tree is felled, is a vigorous upright grower, and may be trained or cut into almost any desired shape. It blossoms in early spring, and the finest honey in the world is gathered by bees which work in the myrtle groves. It grows in abundance on the river bottoms in this county and one or two counties south of here, but only on the western slope of the coast mountains, and along the streams. It is being cut for lumber and for fuel, and burned in heaps to clear the land for cultivation. Many trees are left standing for ornamental purposes, for which they are unsurpassed by any evergreen known.

The fruit is also ornamental, being a round nut inclosed in a smooth green hull, which hangs pendant-like on the branches, something after the man-

ner of fuchsia blossoms. These nuts are somewhat bitter, and are therefore not eaten by people, but are valuable food for pigs, which in these river bottoms keep fat and fine all winter. Large numbers of young trees are to be found in the woods here, grown from nuts which have lain over winter.

This tree must certainly become a leading evergreen for ornamentation, as it is unsurpassed by any known tree for all the qualities which make an evergreen desirable; and I have no doubt that a very finely fragrant oil may be distilled from the leaves, useful as a perfume, and perhaps for medicinal purposes. Having no facilities at hand for the purpose, I have not experimented in this direction, but propose doing so at no distant day.

BREVITIES FROM ABROAD.

Indoor Culture of Tomatoes. — The London *Gardener's Chronicle* describes a method of raising tomatoes within doors which it says has been successful and is worthy of general adoption. The seed is sown about Christmas, and by the first week in March the plants are set out against the back wall of some of the lean-to vineries, in a good compost, with ample root-room. Here they make a rapid and vigorous growth, and in the course of the season attain to a height of from 10 to 12 feet, and produce successional crops of fruit with great profusion until past Christmas. In this manner early and late tomatoes are obtained from the same plants. As a matter of course the plants can hardly be kept too moist, and a good dressing of crushed bones is occasionally given. The border in which the tomatoes are planted is only about 15 inches in width. The plants must be well fed, but the wonderful crops they bear is the best testimony to the advantage of a liberal treatment. The weight of fruit obtained from one plant in a season is something remarkable, and many of them attain a great size.

Utilizing Diseased Potatoes. — A correspondent of the same journal writes as follows: "Finding that we had a large proportion of diseased as well as a few small potatoes, we washed them together, and boiled them in a copper with only a little water at the bottom. When done, they were put into a potato gribble, which mashed them to a pulp. This was stored in a large stone trough, each layer being treated with a sprinkling of salt; and this, covered over to exclude wet, kept dry and sweet and good for a very long time. A little of this potato paste mixed with wash was found to get the pigs on so rapidly, that we bought up all the diseased potatoes we could, not only those belonging to our men, but many from our neighbors also; and with these, treated as above, and mixed with a little barley meal, we are now forcing on a lot of pigs at a rapid and cheap rate."

Another writer tells us that "diseased potatoes are not good feeding for horses, whether steamed or raw, but pigs thrive well on them in the former state, and cattle eat them readily uncooked, provided they are not in a forward state of decomposition. For pigs, potatoes should always be steamed, in order to withdraw as much of the black, bitter juice as possible, and if mixed afterwards with a little bran, bean, pea, or barley meal, they will be found excellent food for those animals."

Pickle for Beef, Pork, etc. — The following recipe is from an English source: Take 4 gallons of water, 6 lbs. of common salt, 1 lb. of saltpetre, 2 lbs. of coarse brown sugar; boil these ingredients together and strain the liquor. When cold, put the beef, etc., into it, and keep all entirely covered with the pickle, and in ten days it will be fit for use, but it may be kept much longer in the pickle if necessary. In six weeks the pickle must be boiled again, and 1 lb. of salt added. The pickle will remain good for using twice, but no longer.

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PUBLISHERS' NOTICE.

With this number of the Journal bills are sent to those of our subscribers who are in arrears. The bills are individually *small*, and it can be no great inconvenience for our patrons to promptly inclose the amount, and thus aid us in meeting the large expense incurred in publishing the paper. If the matter is attended to as soon as the bill is noticed, it will not be forgotten.

THE JOURNAL.

We designed to present to our readers in January an exceptionally excellent and interesting number of the Journal, but in examining its contents we are reminded of the remark of a friend who sometimes obtains his reading in advance by looking over the proofs, that "it is equally excellent with all the other numbers of the past year, and it would be difficult to make any number better than the others have been." We have three or four large classes of readers to interest and instruct, and it has been our aim each month to present the best, most useful, and most attractive facts and incidents in science and art which were within our reach. Our reach is indeed a broad one, as from the long-established reputation of the Journal, and from the fact that it is welcomed in thousands of cultivated families in every section of our own and other countries, its correspondence is wide and varied. We have placed upon our table daily the best and most costly journals and magazines published here and in Europe, and our contributors, whose names are not often published, are of distinguished reputation as teachers in science. Having had these aids for several years, it is indeed difficult to make any number of the Journal more useful or attractive than former ones have been, but we do not intend to rest satisfied. It shall be our aim in the year before us not only to make the Journal *better*, but to widen its field of usefulness. Arrangements have been made having this end in view, and if we continue to secure the warm approval of our large family of readers it is all we ask.

A WORD TO TEACHERS.

The circulation of the Journal among teachers is probably not less than that of any strictly educational magazine published in the country, and we know it to be larger than that of the majority of such periodicals. It is gratifying to know also that our little monthly is a favorite with the teachers, for there is no class of our patrons whose approval we are more rejoiced to have won. We rarely print any of the complimentary notices that the Journal is continually receiving from the press, but we cannot refrain from quoting the following from the *Maine Journal of Education* for December, 1874:—

"The general reader does not know how much valuable information is contained in this monthly publication. It presents in an attractive form a knowledge of the natural phenomena by which we are surrounded, and awakens in the young especially a desire for more abundant knowledge. It is of use to the farmer, mechanic, artisan, physician, teacher, and in fact to every department and employment of life. For eight years it has been received by us, and we have had the volumes bound and find them almost of daily use."

In this connection we may suggest that teachers will find the work of securing subscribers for the Journal very easy, and our terms to agents (which may be obtained by addressing the publishers) are such as to render it profitable. The periodical needs no "pushing," for it recommends itself wherever a specimen number is presented; and the price is so low that few, even in these hard times, need feel that they cannot afford it. Some of the largest "clubs" ever sent us were obtained by teachers. One of *seventy* names came from a teacher in Tennessee, and the premium for it enabled him to purchase a set of chemical apparatus that amply sufficed for the purposes of his school. Others can do as well, or better, with very moderate effort, and they will find it one of the easiest and pleasantest ways of securing apparatus, reference books, or other appliances useful in their daily labor; easier and pleasanter, perhaps, than persuading school committees or trustees to furnish them.

THE MARCH OF MODERN IMPROVEMENT IN TURKEY.

"The sick man of Europe" has long had the reputation of being decidedly behind the times in regard to all matters of social and sanitary science, but, according to recent intelligence, he is beginning to recognize the fact that the world moves, and that it is best to move with it. Within the past year or two railways have been built from Constantinople into Asia Minor, and one can visit the Seven Churches with an excursion ticket, and picnic amid the ruins of Diana's temple at Ephesus. And now we read that the horse railways in the capital of the Sultan are "a great success," and that the stock of the company that has introduced them is paying a good dividend. The company runs not only horse-cars to the number of 69, but 107 omnibuses and 175 hackney coaches in connection therewith.

Gas is also being introduced into Constantinople. The *Levant Herald* says that good progress is being made with the gas-works in course of construction at Yedi-Koulé. A recent steamer from Marseilles brought a quantity of necessary material for the works, as also posts, lamps, gas-jets, reflectors, etc. Gas-piping is being laid in the principal thoroughfares, and as soon as the orders now being executed at the celebrated Creuzot foundry in France are finished, all will be in readiness. So that unless some unforeseen obstacle arise, there is every reason to believe that the Stamboul gas-works will be in operation, and modern Byzantium lit with gas, by the end of the year. A project is also on foot, according to the same authority, for bringing a water supply to Pera from Stranja; and a new sanitary commission proposes to submit to the government a deliberately considered plan for the purification of the city. At a recent meeting it decided upon recommending an immediate improvement of the sewers, and the construction of butchers' slaughter-houses outside the town.

From other sources we learn that a cotton factory is about to be erected near Smyrna. Such have been the prejudices of the Mohammedans

against enterprises of this kind that in some cases they have led to riot and bloodshed.

Popular education is also being encouraged, both by the government and by the people. We read that "the authorities of the Turkish province of the Danube having ordered that the skins of sheep sacrificed at the recent festival of the Baïram should be set apart and sold for the benefit of the public schools, the bulk of the householders of the province responded to the call, and a vast number of sheepskins were in a short time collected and sold." The same journal states that "an enterprising firm lately paid 200 rupees for the privilege of collecting the hair shorn from the heads of pilgrims at the Magh Mela of Allahabad, and the whole capillary harvest has been sent to England to be made into chignons;" but whether in this case the proceeds were devoted to the public schools we are not informed.

On the whole, with his steam and horse railways, his gas-works, water-works, and cotton mills, his sanitary reforms and common schools, the Commander of the Faithful would appear to be on the high-road of modern progress. It would not be strange if in his newborn zeal for improvement he should leave some of his Christian contemporaries behind him.

ANSWERS TO CORRESPONDENTS.

It will be noticed that the column formerly devoted to answers to the inquiries of correspondents has been again opened, and it is done in accordance with the requests of a very large number of the readers of the JOURNAL. It was closed because the number of inquiries became so large that it was impossible to give attention to a tenth part of them. And now we desire to say to our friends that while we are ready to receive their inquiries we cannot promise to answer them. A large majority received are strictly personal in their nature, designed for the benefit of the individual and not for the general reader. Such inquiries we cannot give attention to. All answers made will have a general interest for all our readers, and this is due in simple justice to them.

BUSINESS ITEMS.

PLEASE SEND NO MORE. — A gentleman wishing to procure Nos. 1 and 11 of Vol. VI., to complete a file of the JOURNAL, advertised under the editorial head for those numbers, in our last issue. Having the impression that they would be difficult to obtain, a large price was offered for them, and the consequence is that hundreds of copies have been sent to the office from every section of the country. The first copies received were taken and paid for, and the rest we shall have to return to the senders. We sincerely hope our friends will forward no more, and having learned the advantages of the JOURNAL as an advertising medium, more caution will be exercised when any want is made known.

SAFE FOR SALE. — Messrs. Billings, Clapp, & Co. offer for sale a Morris and Ireland Safe, with double doors both inside and outside, combination lock on outer doors, and good inside lock also. It is 5 feet high, 45 inches broad, and 35 inches deep, and is on iron wheels. It was made to order for Messrs. Billings, Clapp, & Co., but they have no use for it in their new office, a fire-proof vault being a part of the building. This is an excellent opportunity to purchase a first class safe on very favorable terms, which may be learned on application at the office.

EDITORIAL NOTES.

HARVARD UNIVERSITY. — According to the Catalogue for 1874–75, there are 1196 students in the various departments of the university, 716 of whom are in the college proper, 139 in the law school, 192 in the medical school, and 29 in the scientific school. No students are recorded in connection with the school of mining, the astronomical observatory, or the museum of comparative zoölogy. The Bussey Institution, with 12 teachers, some of whom have work in other departments, has only 4 pupils. The Examinations for Women, which were held for the first time in June, 1874, are to be continued. It was not expected that many candidates would present themselves at the first examination, but a good number are probably preparing themselves for the second. Last June, certificates of success in the "preliminary examination" were granted to four young ladies.

It is announced as a new requisition for admission to the college in 1876 and thereafter, that candidates will be examined in one of three subjects in elementary science: (1) Elementary Botany; (2) Rudiments of Physics and Chemistry; (3) Rudiments of Physics and of Descriptive Astronomy. Teachers can get an idea of the nature and extent of this requisition from the text-books suggested, which are Gray's "How Plants Grow," Stewart's "Primer of Physics," Roscoe's "Primer of Chemistry," and Rolfe and Gillet's "Handbook of the Stars" (first 124 pages). Candidates who offer Botany must be able to analyze simple specimens; and those who offer Physics or Chemistry, to perform simple experiments like those described in the Primers.

The Catalogue, from which we glean these facts, is a pamphlet of 312 pages, 152 of which are devoted to the usual information concerning the various departments, and the remainder to the examination papers used for the collegiate, divinity, law, scientific, and medical examinations of last year, and for admission this year. It is published at the University Bookstore, Cambridge, by Mr. C. W. Sever, who has had charge of it since the university ceased to issue an annual catalogue for gratuitous distribution.

DARWINISM BY DESCENT. — Many of our readers are doubtless aware that Charles Darwin is the grandson of Dr. Erasmus Darwin, who in 1791 published a long didactic poem entitled "The Botanic Garden;" but probably very few of them have ever read the work, though it made no small sensation when, to use the words of a contemporary critic, "it burst on the public notice in all its splendor." They may therefore be interested in the following brief extract, which we find in an English journal, and which shows how closely the author's theories agree with those of his famous grandson: —

> "Organic life beneath the shoreless waves
> Was born and nursed in Ocean's pearly caves.
> First forms minute, unseen by spheric glass,
> Move on the mud or pierce the watery mass;
> These, as successive generations bloom,
> New powers acquire, and larger limbs assume,
> Whence countless groups of vegetation spring
> And breathing realms of fin, and feet, and wing."

In a note combating the "prejudices" against the doctrine of spontaneous vital production, Dr. Darwin holds that "there is more dignity in our idea of the Supreme Author of all things, when we conceive Him to be the cause of causes, than the cause simply of the events which we see;" and further on intimates the unlikelihood of the larger and more complicated animals being thus produced, as they "have acquired their present perfection by successive generations during an uncounted series of ages."

JUVENILE SCIENTIFIC LECTURES. — During the Christmas holidays there are annually delivered in London two courses of scientific lectures specially prepared for a juvenile audience; one at the Royal Institution, and the other under the auspices of the Society of Arts. This year the former course of six lectures is to be given by Dr. J. H. Gladstone, on "The Voltaic Battery;" and the latter, also of six lectures, by Professor McLeod on "The Food and Work of the Iron Horse." Those who have read Faraday's admirable lectures on the "Chemical History of a Candle," and on "Physical Forces" (both reprinted in neat little volumes by the Harpers, if we remember right), are aware that they were delivered in this way at the Royal Institution. The plan is a most commendable one, and, if there is nothing in the terms of the bequest that forbids it, we should be heartily glad to see it adopted at the Lowell Institute in this city. It would be an added attraction in the excellent programme prepared every winter by the devoted and judicious trustee of that endowment.

FLUORESCENCE IN CASTOR-OIL. — A writer in the *Philosophical Magazine* states that certain coloring matters derived from woods, which do not exhibit fluorescence when dissolved in either water or alcohol, become highly fluorescent on treatment with castor-oil. For example, camwood exhibits in this way a strong apple-green fluorescence, although entirely destitute of fluorescent properties in aqueous or alcoholic media. Other substances which fluoresce to some extent in alcohol become more intensely fluorescent in castor-oil. Thus, turmeric in castor-oil gives an emerald-green light, at least three times as vivid as that obtained in other fluids.

THE WRONG BOTTLE. — Every one has heard of the recklessness of English miners in opening their Davy lamps to light a pipe, at the risk of causing an explosion that may "put out their pipes" forever. There was a recent illustration of their carelessness in an accident which occurred in a coal-pit in the north of England. The cause was as comical as the results might, under other circumstances, have been tragical. A collier went to his work, taking with him two bottles, almost similar in form, one of which contained tea and the other blasting-powder. After working for a short time, feeling inclined for a drop of his tea, he took from his jacket pocket by mistake the bottle of gunpowder, and held it over the flame of his lamp for some time, when it exploded, and burnt and cut him rather severely about the neck and face.

ATOMS.

BY royal decree, female students in Sweden are to be admitted on the same terms as males to all the examinations in the universities, except those for the licenses in theology and law. — The collection of gems in the British Museum has been recently enriched by the purchase of a splendid zircon or jacinth; it is no larger than a common garden pea, but it is one of the finest specimens known, and its cost was upwards of £700 sterling, or $3500. — One per cent. or less of phosphorus so far modifies cast iron that it will resist the action of concentrated sulphuric acid to a greater degree than when entirely free from phosphorus; and those who separate silver and gold by the sulphuric acid process find that some cast iron vessels are destroyed in a few weeks, while others will last for years. — The first mention of silk in connection with the worm producing it occurs in the fifth book of Aristotle's "History of Animals;" and the island of Cos is there said to be the place where the fibre was woven into cloth. — The down of the eider duck combines with its peculiar softness, fineness, and lightness so great a degree of elasticity, that the quantity of this beautiful material which can be compressed and concealed between the two hands of a man will serve to stuff the coverlet of a bed. — "Spent madder," or madder from which the

dye has been obtained, used to accumulate in England until it became a nuisance, and the rivers were polluted in carrying it away: now, by treating it with hot acid, it is again rendered available. — A mixture of muriatic acid and alum dissolved in water imparts a golden color to brass articles that are steeped in it for a few seconds. — In the eighteen largest English towns the average of deaths from zymotic diseases is 16.35 per cent. of the total annual mortality. — A correspondent of the London *Chemist and Druggist* says that paste is kept moist and specially sweet and free from smell, by mixing glycerine with it in the proportion of about one teaspoonful of glycerine to half a pound of paste; according to another authority, glycerine is antiseptic, one part to ten of water preserving animal substances equal to spirit. — Canadian papers state that application will be made to the Legislature next session for an act to incorporate the Stadacona Bridge Company, having for its object the construction of a bridge across the River St. Lawrence at or near Quebec, for railway and other purposes. — It is said that Europe will soon be compelled to look to America for the enormous quantities of tar that she uses; she has heretofore in a great measure obtained her supply from Archangel, in the White Sea, Russia, and the Gulf of Finland, Baltic Sea; but it appears the trees are giving out. — In a paper "On the Periodicity of the Rainfall in the United States in Relation to the Periodicity of the Solar Spots," Professor Brocklesby concludes from his investigations that there is a connection existing between rainfalls and variations in the sun-spot area; the rainfall rising above the mean when the sun-spot area is in excess, and falling below when it is deficient. — A workman was lately brought before a police court in London, who, it was proved, drank the pint of furniture polish and pint of spirit served out to him for his day's work. — In spite of all that has been written about the chemical composition of ultramarine, it can hardly be said that its constitution is yet fully understood; the Society of German Ultramarine Manufacturers has, consequently, offered a prize of one thousand imperial marks for the best scientific and experimental work upon the chemical constitution of this substance, and the exact form of combination in which the sulphur exists. — The *International Review* for January contains an article by Rev. Dr. McCosh, of Princeton, on "Ideas in Nature Overlooked by Dr. Tyndall;" also one by Prof. J. M. Hart on "Vienna and the Centennial."— To combine india rubber with glue, dissolve both in ether free from alcohol; bichromate of potash can be combined with glue by dissolving both in water. — According to Böttger, a new varnish, by means of which a gold lustre is imparted to the surface of leather by simply laying it on with a broad brush, consists merely of a somewhat concentrated solution of fuchsine in an alcoholic solution of shellac. — *Harper's Weekly* for December 12th contains an illustrated description of the new Bessemer saloon-ship, which gives one a very clear idea of the construction of that vessel. — "Funerals furnished and conducted for the trade" is the rather singular announcement made by a London firm in a local journal. — Cotton seed is becoming one of the chief exports of Egypt, the amount sent out of the country (mainly to England) having risen from 1090 cwt. in 1860 to 3,490,080 cwt. in 1873. — A Swiss correspondent of *Engineering* says that there are now in his country 15 kilometres of lines of one metre gauge opened, 93 building, and 130 projected, being a total of 238 kilometres, or about 148 miles of narrow gauge railways. — As there are rival editions of "Mother Goose" in the market, it is important to know that the only complete, accurate, and critically annotated edition of that classic anthology is the one published by Hurd and Houghton. — The January number of *Vick's Floral Guide* (published quarterly at 25 cents a year) contains over 100 pages and 500 engravings, and is full of practical information on floricultural matters.

QUESTIONS AND ANSWERS.

T. N. S., Meriden, Ct. "The metal nickel is now largely used in the art of nickel plating; may I ask if there is any danger of the supply becoming exhausted, what is the history of the metal, and where does it come from?" *Answer.* The annual production of the metal at the present time from all the known mines in the world is about 700,000 lbs.; 500,000 of which is produced in Europe and 200,000 lbs. in this country. It has within the past ten years risen in price from $1.50 per lb. to $4.00, in consequence of the immense consumption in the beautiful process of nickel plating. There are nickel mines in England, Belgium, Switzerland, Germany, Norway, and Sweden. The greatest producers of nickel in Germany are the Saxon Cobalt Company, of Oberschlema in Saxony. This company produce annually about 10,000 lbs. It is never found alone, but usually in association with cobalt, bismuth, arsenic, etc. In Sweden it is found in association with copper and iron. In Norway there are ten nickel mines, producing about 100,000 cwt. of raw ore, which is principally magnetic iron ore with about three per cent. of nickel. The nickel mines in this country are principally in Pennsylvania. The "Gap mine" yields considerable quantities. There is no special cause for apprehension that the supply will fall short of the demand. There is plenty of the metal, and large demands will bring it into the market.

B. S., Portland, Me. Citric acid is obtained from limes, lemons, etc., and could undoubtedly be procured from the wild fruits of similar nature in the South, which are so abundant. There is a berry, *Vaccinium vitis*, growing in Germany, which according to recent investigation contains 1½ per cent. of citric acid, and ½ per cent. of malic acid in its juices. It is thought that citric acid may be profitably made from this berry.

T. R. B., Burlington, Iowa. The great trees of California are not found in any other country. It is true, they belong to the general cypress family, but they are, as Professor Gray observes, *sui generis*. These redwood trees are remarkable for their *isolation*. They are isolated systematically, and extremely isolated geographically. They seem to have been created local and lonely denizens of California only.

M. E., Amherst, Mass. We do not believe in very deep ploughing on most lands. There is no doubt that much permanent injury was done to fields during the excitement regarding "sub-soiling." It is not often advisable to sub-soil. An old, experienced farmer once said to a new-beginner in farming, "Young man, let me give you a little piece of advice, will you? Never stir up your soil deeper than you are able to manure it." This is an axiom which it is well to remember.

J. W. H., Chester County, Pa. It is not practicable to attempt to increase the coloring matter in butter by supplying peculiar foods to cows. The golden color in butter is due to the breed of the cow, in a great degree. The high grade Jerseys supply yellow cream and yellow butter, even if the food is of indifferent quality. Some cows will furnish butter white as snow, no matter what kind of food is furnished. Carrots do not add to the amount of the coloring principle when fed freely. Most of the very yellow butter in the market is colored with a preparation of arnatto.

Mrs. S. P., Northfield, N. H. No; if you desire to boil meat in the best manner, you must not have your water boiling hot, and then suddenly put it in the vessel. By such a course you will coagulate or harden the animal albumen on the outer surface of the meat, and the transmission of heat to the interior will be arrested. The meat will be likely to be underdone in the interior, whilst the outside will be unduly hard. Put the meat into cold water and bring the whole gradually to the boiling point.

Several Correspondents. We shall be happy to have you visit Lakeside Farm, but do not advise you to come in the winter. Everything outside of comfortable parlors in New England, in winter, is cheerless and uninviting. The snow prevents all observation of fields and lakes.

B. L. N., Ithaca, N. Y. Prevent taking cold, by using dry friction over the whole surface of your body, night and morning. The hand is often better than hair gloves, or towels. Try hand rubbing, and you will find the catarrh greatly benefited.

F. S., Framingham, Mass. Yes, bowlder rocks of the granitic varieties will split as well in winter as in summer. We had workmen splitting and chiselling rocks last winter, when the thermometer was below zero, and found no difficulties in the work.

"Vertebrate," New York. A correspondent with this signature writes as follows: "The article in the December number on the 'Lords of the Insect Creation,' reviewing a portion of the great family of Articulata in regard to their intelligence, is carefully prepared, and presents an array of facts not to be disputed. The double line of ants passing in different directions, going unladen and returning with a fair load, can be seen on any day in the tropics, and more especially on the Isthmus, at Aspinwall, where a hard path, free from grass, is formed from in front of the 'Ice House' up to the gardens of the Pacific Mail Steamship Company. It is surprising to see the intelligence of these animals, even to the expression of their faces, which seems to be much more cheerful on their return trip with a load, than it was when going up empty-handed. What a lesson we can learn from these industrious, patient creatures, and what lives of contentment we might enjoy if we imitated them, and took just enough of the bitters of life to temper our spirits, and then with the added sweetness, without which it would be harsh and unpleasant, we could drink our libation to the Hymenoptera."

Our friend is perhaps a little imaginative in what he says about the expression of the faces of the ants; and the moral which he draws from their behavior, though poetical, is a little "mixed" — unless it be one of those cases "where more is meant than meets the ear," as Milton hath it.

M. F. T., Boston. Our fair correspondent is right in distrusting the recipes for beautifying the complexion and the like, which appear in the newspapers. As a rule they are either worthless or positively mischievous. The best cosmetics are pure air, wholesome food, and regular habits. If artificial appliances must be added, many good hints may be found in the "Bazar Book of Health" and the "Ugly Girl Papers" (the latter just published), which are made up of articles that have appeared in *Harper's Bazar* — a journal which we may safely except from the general condemnation expressed above. Its advice on these matters is almost invariably sensible and judicious.

J. B., Springfield, Mass. Glue is generally employed for fastening cloth to tables, desks, etc.; but great care must be taken that the glue is not too thin, and it chills so soon that none but an experienced workman can lay and smooth the cloth promptly enough, especially on large surfaces. It would be safer for the amateur to use a paste prepared for the purpose. The London *Furniture Gazette* gives the following recipe for such a paste, with directions for applying it: —

"To every pint of the best wheaten flour add rosin, very finely powdered, about two large spoonfuls, alum one spoonful, in powder; mix them well together, and add by degrees soft or rain water, carefully stirring it till the whole is of the consistence of thinnish cream. Put it into a saucepan over a clear fire, keeping it constantly stirred that it may not get lumpy; when it is of a soft consistence, so that the spoon will stand upright in it, it is done enough; you must be careful to stir it well from the bottom, that it does not burn, which it is very apt to do if not well attended to. You have now only to empty it out into a pan and cover it over till cold, to prevent a skin forming on the top, which would make it lumpy and improper for use.

"This paste is very superior and adhesive. To use it for cloth or baize, spread it evenly and smoothly on the top of the table, and lay your cloth on it, pressing and smoothing it with a flat piece of wood; let it remain till dry, then trim the edges close to the cross-banding. If you cut it close at first it will in drying shrink and look bad where it meets the banding all round. If it is used for leather, the leather must be previously damped, and then the paste spread over it; it is next laid on the table and rubbed smooth and level with a linen cloth, and the edges cut close with a sharp knife to the banding."

F. E. E., Cincinnati, O. There is no "Pharmaceutical Latin Grammar" published in this country, though we have the impression that such a book has appeared in England. A good deal of the medical Latin of the day is of a kind that is taught in no grammatical manual, unless it be the "Comic Latin Grammar," a very amusing book now out of print. The neat little "Physician's Prescription Book," of which the fifteenth edition was published two or three years ago by Lindsay and Blakiston, contains directions for writing prescriptions and other pharmaceutical Latin correctly, with rules for the pronunciation of the terms used, etc., etc.

For studying the elements of Latin, with or without a teacher, we know of no better text-book than "McClintock's First Latin Book," nor for Greek than his "First Greek Book." They have some special merits for which we look in vain in more recent manuals. If one wants a mere Latin grammar, there is nothing superior to Allen and Greenough's.

LITERARY NOTES.

A neat little work by Professor Plympton, of Brooklyn, N. Y., entitled *A Guide to the Use of the Blowpipe*, has been recently published by Van Nostrand. It is a compilation from German and French sources, and in general appears to be well edited. Some of the recent improvements in this department of analysis are not noted; as, for instance, Bunsen's invaluable system of flame reactions. Instead of the dissertation on flame color tests, a short explanation of the spectroscope, or of Professor Eaton's use of the simple prism, might profitably have been introduced. In this connection we may state that a very convenient direct-vision spectroscope is now made at the Stevens Institute, Hoboken.

Among the new books of interest to chemists, announced by Van Nostrand as in press, are *Outlines of Proximate Organic Analysis*, by Professor A. B. Prescott, of the University of Michigan; and *Chemical Examination of Alcoholic Liquors*, by the same author.

Lippincott & Co. have published *Frazer's Tables for the Determination of Minerals*, a translation, with important additions, of the tables of Professor Weisbach, of Freiberg. This is a work that every collector of minerals has often felt the want of; and it will be equally useful to the amateur and to the student.

Lectures on Qualitative Analysis, by Prof. H. B. Hill, published by G. P. Putnam's Sons, is a compact manual, thoroughly up with the times. The author, a son of Ex-President Hill of Harvard College, where he himself has been lately made Assistant Professor of Chemistry, is one of our most promising young chemists.

The latest issue in the "International Scientific Series," and the second American contribution to the list, is Dr. J. W. Draper's *History of the Conflict between Religion and Science*. It is a book to which no brief notice can do justice, and our limits forbid any extended review. One of its incidental characteristics is the mass of interesting information it gives with regard to the progress of scientific knowledge. The author has "sought to present a clear and impartial statement of the views and acts of the two contending parties." In speaking of Christianity, he says that "reference is generally made to the Roman Church," not to the Protestant churches, whose opposition to science has seldom "passed beyond the exciting of theological odium."

A new volume in Macmillan's "Nature Series" is *Spottiswoode's Polarisation of Light*, which the teacher of physics will find exceedingly suggestive in his experimental work, while it will interest the general reader as a concise and well illustrated presentation of the subject.

Another recent book of Macmillan's is *Pharmacographia*, "a history of the principal drugs of vegetable origin met with in Great Britain and British India," by F. A. Flückiger, Professor in the University of Strasburg, and D. Hanbury, F. R. S. Under the head of each drug are given its Latin name and synonyms; its botanical origin; its history; its formation, secretion, or method of collection; its chemical composition; its production and commerce; its uses; and its adulterations, if any. The authors have not made a mere compilation from earlier treatises, but have investigated the whole field anew, in order to clear up doubtful points, and as far as possible to remove the uncertainties connected with the subject. The task has been faithfully and ably performed, and the result is a convenient and reliable work of reference for the pharmacist and the physician. It may be found, with other recent medical and scientific books, at Williams & Co.'s.

Among the holiday books of the season, *Wolf's Wild Animals*, published by the Harpers, is one that will equally attract the lover of art and the lover of nature. It contains twenty full-page illustrations from designs by Joseph Wolf, a painter of remarkable power, whose work has long been highly appreciated abroad, though little known in this country. They are admirably engraved by J. W. and E. Whymper, and accompanied with descriptions by D. G. Elliot. They are dramatic sketches of animal life, full of action and spirit — a pictorial refutation of the theory that animals are mere automata. The volume, to our thinking, is far superior to some of the more costly gift-books of the season.

Another book, handsome enough and entertaining enough for a holiday present, is Sir Samuel Baker's *Ismailia*, a narrative of the expedition to Central Africa for the suppression of the slave-trade, organized by Ismail, Khedive of Egypt, and placed by him under Baker's command. It is intensely interesting, and copiously illustrated with wood-cuts, maps, etc. It forms the subject of an illustrated article in *Harper's Magazine* for January, from which the reader can get a better idea of it than from this brief notice.

Curtius's History of Greece has been several times commended in our columns as a masterpiece of historical literature, remarkable for its accuracy and learning, and no less so for the vivacity and grace of its style. In fulness it is a happy medium between the dry compends made for school use and the heavy works of "learned length" that have hitherto been the student's only alternative. Scribner, Armstrong, & Co. have now completed the American edition by the issue of Vols. IV. and V., the latter of which contains an excellent general index of 38 pages. The work is uniform with their edition of *Mommsen's Rome*, which is equally meritorious in its way.

The International Review, published by A. S. Barnes & Co., has proved a success already, and enters upon its second volume with the most favorable auspices. It is furnished *with the* JOURNAL for $5.00, the regular price of the *Review* alone. In this connection we would again call attention to "Our Clubbing List," which we may safely say is the fullest and the best offered by any American periodical. It contains not only all the leading scientific, medical, literary, and popular magazines and journals published in this country, but a select list of foreign periodicals which, by special arrangement, we are able to furnish *at lower rates* than ever before known on this side of the Atlantic. If our friends will look into the matter for themselves, they will find this statement true to the letter. Magazines, for instance, which we offer *with the* JOURNAL for $6.00 a year, are advertised in New York at $8.00 for the magazine alone. The reader will do well to look over our Clubbing List before ordering his periodicals for 1875.

A new educational weekly, to be called *The New England Journal of Education*, is to appear in Boston with the new year, under the auspices of the American Institute of Instruction and the Teachers' Associations of the several New England States. Hon. T. W. Bicknell resigns his position as Commissioner of Public Schools in Rhode Island to become its editor. Each number will contain twenty large folio pages, and the subscription price will be $3.00 a year. We can furnish it *with the* JOURNAL for $3.25 a year, the postage on both being included. Teachers and friends of education will please "make a note" of this.

Medicine and Pharmacy.

INVERTING THE BODY IN CHLOROFORM POISONING.

IF dentists and doctors are to go on using chloroform as an anæsthetic, they ought to be familiar with what is known in Europe as "Nélaton's method" of dealing with cases of narcosis occurring from its administration. This treatment was the subject of two communications at the late meeting of the British Medical Association at Norwich, Eng., where it excited much interest. The first of these was so graphic a description of the method that we reprint the full report of it given in *The Doctor*: —

Dr. Marion Sims thus related a case in which Nélaton was present: "In the midst of the operation, the chloroformist, Dr. Campbell, said, 'Stop! stop! No pulse, no breathing!' and, looking to M. Nélaton, he said, 'Tête en bas, n'est-ce pas?' Nélaton replied, 'Certainly; there is nothing else to do.' Immediately the body was inverted, the head hanging down, while the heels were raised high in the air by Dr. Johnston, the legs resting, one on each of his shoulders. Dr. Campbell supported the thorax. Mr. Herbert was sent to an adjoining room for a spoon, with the handle of which the jaws were held open, and I handed M. Nélaton a tenaculum, which he hooked into the tongue, and gave in charge to Mr. Herbert; while to Dr. Beylard was assigned the duty of making efforts at artificial respiration, by pressure alternately on the thorax and abdomen. M. Nélaton ordered and overlooked every movement, while I stood aloof and watched the proceedings with, of course, the most intense anxiety. They held the patient in this inverted position for a long time before there was any manifestation of returning life. Dr. Campbell, in his report, says it was fifteen minutes, and that it seemed an age. My notes of the case, written a few hours afterwards, make it twenty minutes. Be this as it may, the time was so long that I thought it useless to make any further efforts, and I said, "Gentlemen, she is certainly dead, and you might as well let her alone." But the great and good Nélaton never lost hope, and by his quiet, cool, brave manner he seemed to infuse his spirit into his aids. At last there was a feeble inspiration, and after a long time another, and by and by another; and then the breathing became pretty regular, and Dr. Campbell said, 'The pulse returns, thank God; she will soon be all right again.' Dr. Beylard, who always sees the cheerful side of everything in life, was disposed to laugh at the fear I manifested for the safety of our patient. I must confess that never before or since have I felt such a grave responsibility. When the pulse and respiration were well reëstablished, M. Nélaton ordered the patient to be laid on the table. This was done gently. But what was our horror, when, at the moment the body was placed horizontally, the pulse and breathing instantly ceased. Quick as thought the body was again inverted, the head downwards and the feet over Dr. Johnston's shoulders, and the same manœuvres as before were put in execution. Dr. Campbell thinks it did not take such a long time to reëstablish the action of the lungs and heart as in the first instance. It may have lacked a few seconds of the time; but it seemed to me to be quite as long. For the same tedious, painful, protracted, and anxious efforts were made as before, and she seemed, if possible, more dead than before; but, thanks to the brave men who had her in charge, feeble signs of returning life eventually made their appearance. Respiration was at first irregular, and at long intervals; soon it became more regular, and the pulse could then be counted; but it was very feeble, and would intermit. I began again to be hopeful, and even dared to think that at last there was an end of this dreadful suspense, when they laid her horizontally on the table again, saying, 'She is all right this time.' To witness two such painful scenes of danger to a young and valuable life, and to experience such agony of anxiety, produced a tension of heart and mind and soul that cannot be imagined. What, then, must have been our dismay, our feeling of despair, when, incredible as it may seem, the moment the body was laid in the horizontal position again, the respiration ceased a third time, the pulse was gone, and she looked the perfect picture of death! Then I gave up all as lost, for I thought that the blood was so poisoned, so charged with chloroform, that it was no longer able to sustain life. But Nélaton, and Campbell, and Johnston, and Beylard, and Herbert, by a consentaneous effort, quickly inverted the body a third time, thus throwing all the blood possible to the brain, and again they began their efforts at artificial respiration. It seemed to me that she would never breathe again; but at last there was a spasmodic gasp, and, after a long while, there was another effort at inspiration, and, after another long interval, there was a third; they were 'far between;' then we watched, and waited, and wondered if there would ever be a fourth; at length it came, and more profoundly, and there was a long yawn, and the respiration became tolerably regular. Soon Dr. Beylard says, 'I feel the pulse again, but it is very weak.' Nélaton, after some moments, ejaculates, 'The color of the tongue and lips is more natural.' Campbell says, 'The vomiting is favorable: see, she moves her hands; she is pushing against me.' But I was by no means sure that these movements were not merely signs of the last death-struggle, and so I expressed myself. Presently Dr. Johnston said, 'See here, doctor; see how she kicks; she is coming round again;' and very soon they all said, 'She is safe at last.' I replied, 'For Heaven's sake, keep her safe; I beg you not to put her on the table again till she is conscious.' This was the first and only suggestion I made during all these anxious moments, and it was acted upon, for she was held in the vertical position till she, in a manner, recovered semi-consciousness, opened her eyes, looked wildly around, and asked what was the matter. She was then, and not till then, laid on the table, and all present felt quite as solemn and as thankful as I did; and we all in turn grasped Nélaton's hand, and thanked him for having saved the life of this lovely woman."

The other communication on the subject was from Sir John Rose Cormack, who described a case in which the method had proved successful, although the patient remained for a much longer time in a precarious condition.

CROTON CHLORAL.

DR. J. H. JOHNSON, of Providence, R. I., writes us as follows concerning this new remedial agent described in the last number of the JOURNAL: —

During the past three months I have been using in my practice the croton chloral for the relief of nervous headache, wakefulness or loss of sleep, and neuralgia. It has not in one instance failed to accomplish the desired result, and from its peculiar soothing influence upon the fifth pair of nerves I consider it a specific in facial neuralgia. I believe this remedy in skilled hands is destined to become one of the greatest blessings to suffering humanity since the discovery of chloroform. One case of neuralgia of many years' standing, which had baffled much able treatment, was speedily relieved by the first dose of this invaluable agent, and the patient assures me she has perfect faith in an ultimate cure. I could cite many cases relieved and cured by this remedy.

I prescribe the croton chloral in solution, each teaspoonful containing three grains. One teaspoonful may be given every four hours, till the pain ceases, or sleep ensues, but I have seldom been obliged to give a second dose to produce the desired effect.

This powerful remedy should be used with care, and the patient requires the daily attendance of his physician during its administration. It is not a safe remedy for patients to tamper with, and use at their own option.

THE EDUCATION OF GIRLS.

WHATEVER we may think of some points in Dr. Clarke's "Sex in Education," the following passage is one to which no advocate of a really elevated standard of female education can fairly make any objection: —

Boys must study and work in a boy's way, and girls in a girl's way. They may study the same books, and attain an equal result, but should not follow the same method. Mary can master Virgil and Euclid as well as George; but both will be dwarfed — defrauded of their rightful attainment — if both are confined to the same methods. It is said that Elena Cornaro, the accomplished professor of six languages, whose statue adorns and honors Padua, was educated like a boy. This means that she was initiated into and mastered the studies that were considered to be the peculiar dower of men. It does not mean that her life was a man's life, her way of study a man's way of study, or that, in acquiring six languages, she ignored her own organization. Women who choose to do so can master the humanities and the mathematics, encounter the labor of the law and the pulpit, endure the hardness of physic and the conflicts of politics; but they must do it all in woman's way, not in man's way. In all their work they must respect their own organization, and remain women, not strive to be men, or they will ignominiously fail. For both sexes there is no exception to the law that their greatest power and largest attainment lie in the perfect development of their organization. "Woman," says a late writer, "must be regarded as woman, not as a nondescript animal, with greater or less capacity for assimilation to man." If we would give our girls a fair chance, and see them become and do their best by reaching after and attaining an ideal beauty and power which shall be a crown of glory and a tower of strength to the republic, we must look after their complete development as women. Wherein they are men, they should be educated as men; wherein they are women they should be educated as women. The physiological motto is, Educate a man for manhood, a woman for womanhood, both for humanity. In this lies the hope of the race.

TESTING FOR ALOES AND OTHER BITTER PRINCIPLES.

THE following method of testing for bitter substances employed in medicine was devised by O. Basch. The liquid to be analyzed is evaporated to dryness and extracted with alcohol, which takes up most of these principles. Sand is mixed with the solution, which is then evaporated on a water bath to dryness. The residue is pulverized and treated with cold water, when the active principles of the aloe, the bitter apple (colocynth), wormwood, and gentian are dissolved. When water no longer takes up anything, the solution, which is more or less colored, is evaporated to a small bulk on a water bath, and when cold an excess of mercurous nitrate is added, when colocynth and wormwood are immediately thrown down as a voluminous precipitate. This is rapidly filtered out, washed, and dissolved in dilute nitric acid; it dissolves quicker if heated. If colocynth is present, the yellow liquid will contain insoluble flakes. If wormwood is also present, the solution will be brown, so that it will be difficult to distinguish the flakes. The acid liquid is treated with excess of ammonia, which precipitates the mercury and dissolves the colocynth and wormwood. On filtering, the filtrate will be of a beautiful yellow if the former alone is present, but brown if both are present. The solution is evaporated to dryness and treated while still warm with acetic acid, which dissolves the wormwood but not the colocynth. The latter produces with concentrated sulphuric acid a deep red, with Fröhde's reagent (concentrated sulphuric acid 1 c. c., molybdate of soda 1 milligram) a cherry-red solution. The acetic acid solution when evaporated to dryness produces a yellowish brown residue, which dissolves in concentrated sulphuric acid to a brownish yellow liquid, and with Fröhde's reagent yields at first a brown solution which on stirring becomes green and finally violet.

The liquid filtered off from the mercury precipitate may contain aloes and gentian. The excess of mercury is precipitated with ammonia, and a concentrated aqueous solution of acetate of baryta added to the solution. If a precipitate is formed, gentian is present; on the contrary, if the liquid turns orange red, it indicates the presence of aloes. The solution is evaporated to dryness, extracted with alcohol, again evaporated, and the residue treated with warm nitric acid. The yellowish red solution obtained is evaporated to dryness, dissolved in a little water, and potash and grape sugar added, when a blood-red color is produced if aloes are present.

The gentian precipitate formed on adding acetate of barium is also extracted with alcohol, evaporated, and treated with concentrated nitric or sulphuric acid, in which it dissolves with a yellow color, or with potash, in which it dissolves with a fine golden yellow color.

On treating the original substance with water a residue was left, which may be the resinous constituent of the agaric (an excrescence growing on the larch and oak), of scammonium, or of jalap. To separate these the residue is treated with ether when agaric and scammonium dissolve. The solution is evaporated to dryness and the residue treated with an aqueous solution of carbonate of soda, and heated. If scammonium is present a residue is left, which swells in nitric acid to a yellow mass, but dissolves in concentrated sulphuric acid with an orange color, and on standing turns blood-red. The resinous portion of the agaric dissolves in the soda solution, is precipitated again by an acid and tested by nitric acid, in which it is insoluble, while it dissolves in concentrated sulphuric acid with an orange color.

The residue, which is insoluble in ether and in water, is jalap resin, which is proved by dissolving in concentrated sulphuric acid, becoming brown at first and then turning blood-red, while the solution has the strong aromatic odor of jalap resin.

H.

PHYSIOLOGICAL AND MEDICAL NOTES.

A PEEP INTO A PRIMA DONNA'S THROAT. — Dr. Fieber of Vienna, like the little boy that cut open his drum to see where the music came from, has been looking into the throat of Madame Pauline Lucca, and publishes the results of his scrutiny. The mechanical apparatus to which the melody is due appears in her case to be beautifully perfect, owing doubtless partly to natural endowment and partly to the scientific training which she had in early youth. Examined under the laryngoscope, the larynx appears small and well-shaped, its parts being marvellously developed and perfect. The true strings are pure snow-white, and possess none of the bluish tinge common among women. Although shorter than usual among vocalists, they are stronger in proportion, and amply provided with muscle. When at rest they are partially screened by the false strings; but Dr. Fieber, who watched Madame Lucca's throat through his instrument whilst she was singing, noticed that as soon as a tone was struck, they displayed themselves in their full breadth and strength. The aid given by a suitable form of mouth to the production of vocal music is a novel and interesting point brought out by Dr. Fieber. On being admitted to a view of the artist's mouth he was at once struck with the spaciousness and symmetry of its hollow, as well as with the vigor with which every tone raised the "sail" of the palate. He is of opinion that the natural conformation of her mouth accounts in a large measure for the wonderful power she possesses of raising and dropping her voice alternately. The sound-waves are naturally strengthened in a space so favorably-shaped, while the muscles of the palate appear to have acquired exceptional strength and pliability by long practice.

A NOVEL REVENUE QUESTION. — A curious question has lately arisen in one of the Swiss custom-houses in connection with the water from the miraculous fountain of Lourdes. The water of this holy spring is exported largely abroad for the benefit of the faithful, and a consignment having been offered at the Basle custom-house the officers demanded the duty on medicaments. To this it was replied that the water was not a medicament in the usual sense, but only water to which the mystical power of faith alone gives medical properties. The logic of the reply is unanswerable — that the liquid was sent as a medicament to Switzerland, and was therefore subject to duty as such. With the question of its intrinsic value the department had nothing to do, any more than with that of any other empirical remedy.

NO IRON IN THE COLORING MATTER OF THE BLOOD. — More than a year ago MM. Paquelin and Jolly, in a communication to the French Academy of Sciences, asserted that "iron exists in the blood-globules in the state of tribasic ferrous phosphate," but that "hæmatosin contains no iron, as M. Chevreul had already proved, observing that the composition of this coloring matter varies according to the nature of the solvent applied for its extraction; but, at the same time, declaring that we know of no process by which it may be obtained in a pure state." In a recent paper the same authors report: "We have at last been able to obtain the hæmatic pigment in a state of perfect purity and entirely free from iron. This hæmatosin exhibits the following properties. It burns, without leaving any ash, like resinous substances; it is insoluble in pure water; it dissolves a very little in ammonia, to which it gives a pale yellow tint; it is acted upon by caustic potash and soda, to which it communicates a brown tint, and it is slightly soluble in alcohol; the solution becomes amber-colored. The solvents of hæmatosin are ether, chloroform, benzine, and carbonic disulphide. With these bodies, the diluted solution is amber-colored; concentrated, it is red."

EFFECT OF WARMTH IN PREVENTING DEATH FROM CHLORAL. — Dr. Brunton (who, by the way, has succeeded the lamented Anstie as editor of that excellent medical journal, *The Practitioner*) confirms the observations of Liebreich and others, and finds that the subcutaneous injection of a solution of chloral induces sleep, which is light and easily broken if the dose be small, but passes into coma if the dose be large. In dogs, considerable restlessness was observed before sleep came on, and the respiration was at first rendered rapid, but subsequently became slow. A remarkable diminution of temperature was observed, which appears to be partly due to greater loss from the surface, caused by the vessels of the skin becoming much dilated under the influence of the drug, and allowing the blood to be

cooled more readily by a low external temperature. It is partly due also to the diminished production of heat, which cessation of muscular action always induces. Dr. Brunton found that an animal wrapped in cotton-wool may recover perfectly from a dose of chloral which is sufficient to kill it when exposed to the cooling action of the air, and that recovery from the narcotic action is much quicker when the temperature is maintained in this way, and still more rapid when the animal is placed in a warm bath, providing this is not excessive. The bearing of these experiments on the treatment of persons suffering from an overdose of chloral is obvious. The patient should be put to bed, and the temperature of the body maintained by warm blankets and hot-water bottles applied to various parts of the body, especially the cardiac region. Warmth over the heart is an excellent stimulant to the circulation, which, like the respiration, is enfeebled by chloral. If respiration threatens to fail, it should be maintained artificially so as to allow time for the chloral to be excreted and the normal functions to be restored.

Jaborandi. — The London *Chemist and Druggist* says: "A small supply of the new medicine, jaborandi, whose wonderful diaphoretic properties were first mentioned in English in this journal, has been received in Paris. Mr. Martindale has obtained a specimen, and, in conjunction with Dr. Ringer, has experimented with it on two boys at University College Hospital. The physiologic effects corresponded very closely with those reported from Paris."

A Telltale Emetic. — The *London Medical Times and Gazette* tells this old Greek story: "Æsop the fabulist was deformed, a stammerer, and a slave. Of course he was bullied and put upon by his fellow-slaves. One day his master received a present of new figs, which one of the slaves ate up. When the master came home, this slave accused Æsop of having eaten the figs. Whereupon Æsop, unable to stammer out a word of defence, put his finger down his throat, vomited up all the contents of his stomach, showed that there were no figs there, and then by signs demanded that his accuser should do the same. This was done; the stolen figs were brought to light, and the guilty slave received the bastinado, which would otherwise have fallen on Æsop's back. Quick brains made amends for a stammering tongue."

To Detect Artificial Coloring in Red Wines. — M. de Cherville, in *Le Temps*, gives the following useful hints for deciding whether red wines are or are not artificially colored: "Pour into a glass a small quantity of the liquid which you wish to test, and dissolve a bit of potash in it. If no sediment forms, and if the wine assumes a greenish hue, it has not been artificially colored; if a violet sediment forms, the wine has been colored with elder or mulberries; if the sediment is red, it has been colored with beet root or Pernambuco wood; if violet-red, with logwood; if yellow, with 'phytolac' berries; if violet-blue, with privet berries; and if pale violet, with sunflower." Some of these adulterations are harmless to health, but they are none the less objectionable.

SELECT FORMULÆ.

Iodized Glycerine. — The *Druggists' Circular* describes a preparation which contains as much free iodine as the officinal tincture, but has the advantage of not staining the skin. The physicians who have used it, pronounce it equal to the tincture for local application. It is made as follows: —

Iodide of potassium	1 ounce.
Resublimed iodine	1 "
Glycerine, sufficient to complete	16 fluid ounces.

Powder the iodide, and dissolve in about four ounces of the glycerine; add the iodine, and rub well in a mortar until it is dissolved, adding more glycerine if necessary. Lastly, add enough glycerine to complete 16 fluid ounces. The result is a beautiful, permanent solution, which will be found in many cases preferable to the officinal tincture.

Amber-Colored Vials. — The following, according to the London *Chemist and Druggist*, is an easy method, well known to German apothecaries, for giving that color to vials, jars, etc.: Make a varnish by dissolving asphaltum in benzine, and paint the outside of the bottles with it, using a fine camel's-hair brush. After standing about five or ten minutes the varnish will be found dry and hard. In thin layers it looks black; in thinner ones it is of the most approved smoked-amber color, by transmitted light. To all appearances it is perfectly jet-black by reflected light, and looks well on the shelves, provided the painting has been done with some degree of carefulness.

Opium Testing. — The following method is given by C. Arnoldi in a German chemical journal: 500 grams of dry opium are digested in 3 ounces distilled water for 24 hours; the liquid is poured through a weighed filter, and the insoluble part again similarly digested. The insoluble part is then collected on the filter, washed with water so long as the washings are colored, dried and weighed. Good opium should not leave more than 200 grams of insoluble residue. The solution is concentrated to 5 ounces, filtered, shaken with bone-char, and again filtered; to the liquid a slight excess of ammonia is now added, whereby a precipitate of impure morphine is obtained; and this precipitate, after warming to expel excess of ammonia, is collected and weighed. Good opium yields 14.19 per cent. of impure morphine.

THE LABORS OF A "PHARMICAL" DRUGGIST.

The Chicago apothecary who announced to the Pharmaceutical Association at Louisville, Ky., last August, the results of his protracted and arduous analytical labors upon Cincho-Quinine, appears to be resting under a very dark cloud just now. After "*a year*" spent in the immense work of testing the agent, he informed the association that he "could n't find" the alkaloid quinine in the agent. It required less than an *hour* of Professor Genth's time to find "*decided quantities*" of quinine in Cincho-Quinine. The following is his letter, preceded by an introductory note from Professor Maisch, the distinguished pharmaceutical chemist of Philadelphia: —

Office of Permanent Secretary, American Pharmaceutical Association, 145 N. Tenth Street,
Philadelphia, Pa., *December* 21, 1874.

Prof. F. A. Genth, University of Pennsylvania:

Dear Sir, — I have the pleasure of introducing to you Mr. Davis, of the firm of Billings, Clapp, & Co., of Boston, Mass., who is desirous of having an analysis made. Yours very truly,

John M. Maisch.

Chemical Laboratory of the University of Pennsylvania,
West Philadelphia, *December* 21, 1874.

Messrs. Billings, Clapp, & Co., Boston, Mass.:

Gentlemen, — At the request of Mr. C. S. Davis of your firm, I have sent for a bottle of Billings, Clapp, & Co.'s Cincho-Quinine, which was received from Messrs. Rosengarten & Sons under their seal [R & S]. I have tested the same by the four most characteristic tests for quinine, and have found decided quantities of this alkaloid by each of them. Yours truly, F. A. Genth,
Professor of Chemistry and Mineralogy.

Prof. S. P. Sharples, of this city, Assayer to the State of Massachusetts, experienced no difficulty in finding quinine in the agent: —

Boston, *December* 1, 1874.

Messrs. Billings, Clapp, & Co.:

Gentlemen, — At your request I procured a bottle of your Cincho-Quinine from Messrs. Cutler Brothers & Co. It was undoubtedly genuine, being inclosed in your lithograph wrapper, and bearing your label on the bottle, and stamp upon the cork.

I have made a careful examination of the contents of the bottle, and have detected cinchonidine, quinidine, cinchonine, and quinine.

S. P. Sharples, Ph. D.,
State Assayer of Massachusetts.

Prof. G. A. Mariner of Chicago reached the same results: —

Chicago, *December* 16, 1874.

This certifies that at the request of C. S. Davis, of the firm of Billings, Clapp, & Co., I procured a sealed bottle of Cincho-Quinine, and that I have tested the same for quinine, and that I have found that it gives the reactions of that alkaloid very decidedly. G. A. Mariner,
Analytical Chemist, 77 S. Clark St., Chicago, Ill.

So also does Professor Blaney, of Chicago: —

Chicago, *December* 17, 1874.

This is to certify that I have purchased an ounce bottle of Cincho-Quinine, bearing the label of Billings, Clapp, & Co., from a druggist in this city, and submitting it to acknowledged tests for the presence of quinine, obtained reactions of that alkaloid beyond question. James R. Blaney,
Analytical Chemist, corner Randolph and Dearborn Sts., Chicago, Ill.

Professor Merrick, of this city, Professor of Chemistry in the Massachusetts School of Pharmacy, four years ago, in the spring of 1870, examined a phial of Cincho-Quinine, and found abundant evidence of the presence of quinine.

It is evident if this "pharmical" apothecary would stick to his "old tricks," of which he speaks, and not venture upon *new ones*, he would save himself much merited disgrace.

At a late hour before going to press the following letter came to hand, and although not intended for publication, yet as it refers to a matter noticed in the Journal, we venture to publish it: —

Kansas City, Missouri, *December* 16, 1874.

Messrs. Billings, Clapp, & Co.:

Gentlemen, — Inclosed please find my subscription for the Journal of Chemistry; I would not be without your paper for four times its price. It is a regular sandwich for a busy professional man.

I wish to say one word in reference to your Cincho-Quinine, inasmuch as I notice that some uninformed person has been trying to injure its reputation. When you first presented it to the public I analyzed it, and found it to contain the principles of the bark as represented. I then commenced its use, and since that time I have never used one grain of sulphate of quinine and never expect to, as your preparation fulfils all the indications for its use without the unpleasant symptoms which always have rendered and will render the sulphate objectionable, more particularly with children.

I presume I have as many cases as any other practitioner in this vicinity, and have had ample opportunities for testing its virtues. Its price renders it also valuable, but I must state candidly that if the price was more than the sulphate I would then buy it, and pay even double, if I could not obtain it at a less rate.

Respectfully yours, G. E. Heydon, M. D.,
Analytical and Technical Chemist, Kansas City, Missouri.

Boston Journal of Chemistry.

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Familiar Science.

DOES THE USE OF FLOUR PROMOTE AFFECTIONS OF THE NERVOUS SYSTEM?

BY E. CUTTER, M. D.

THE Roman soldier, in the time of Julius Cæsar especially, was the type of the most vigorous manhood, probably, that the world ever saw. For fortitude and endurance in warfare, labor and suffering in campaigns, and perseverance under hardship, his reputation has not upon the whole been surpassed. In his day there were no railroads for transport, not many bridges for passing rivers, no Goodyear to supply india-rubber for protection to feet, head, or body. He had no pontoons, or telegraph, or balloons. No powder, or gun, or rifle, or cannon aided him in destroying his enemies. His was a hand-to-hand conflict, with javelins, swords, and battering-rams. He interviewed his foe in person, and such was his individual physical power and development that his opponents almost invariably succumbed, and Cæsar was master of the known world.

How did the Roman soldier come to possess such a wonderful strength of physical and mental organization that he could accomplish feats of prowess which fill so large a space in the history of the world?

We know how he lived out-of-doors, inhaling plenty of pure oxygen and exhaling carbonic acid, which was immediately borne off and its place supplied with fresh air. If he had lived in one of our modern houses, heated with stoves and laboriously shut up air-tight, with no ventilation except an occasional opening of a door, breathing an atmosphere tainted with carbonic oxide and carbonic acid gases, besides the animal exhalations, with window blinds and sashes closed, and curtains drawn (which is the general average condition of New England houses of to-day), we think that his animal (*anima* means breath) powers would not have allowed him to accomplish his historic achievements.

But the Roman soldier besides breathing had to eat. No matter how much fresh air and exercise he had, his physique would have failed with imperfect food. He could not have developed muscle enough to climb mountains, swim rivers, fight hand-to-hand fights, and endure privations, unless his digestive organs had been fed with aliment which supplied the waste of tissue consequent upon exertion, and the withdrawal of the nerve force, vitality, or life, or whatever you are pleased to call that dynamic power which carries along the currents of our physical existence. In speaking of muscular actions, we are apt to regard the muscles themselves as the sources of power. But if we should separate the nerves which connect the given muscle or set of muscles with the spinal or cranial system of nerve centres, it would be found that they would become as powerless for action as the engine when steam is cut off, or a machine when its connecting belt with the motor is slipped off. So that it is more in accordance with the facts to speak of the nerve force as the primal source of all the muscular forces of the body. In this light we cannot conceive of the Roman soldier as other than a person of immense nerve power. It might not have been an intellectual nerve power, but it must have been a neurotic power sufficient to wonderfully sustain and control the still more wonderful combina ion of mechanical forces found in the muscular system. It is very generally acknowledged by physiologists that there is more or less waste of nerve and muscular tissues during the exercise of the varied functions of the human body. No light is seen, no sound is heard, no touch is felt, no smell is perceived, respiration is not kept up, digestion, secretion, excretion, cerebration, phonation, and muscular movements are not performed without a waste of the tissues which are the agents of the functions named. Now the Roman soldier must have had just this tissue destruction, and he must have supplied it in his food, or else he would have broken down under such severe tests. History shows that he did not break down, and it is a very interesting question what he mainly subsisted upon. In looking over the list of the commissary department of the Roman army, we do not find the modern diet table. *Frumentum*, grain or wheat, was the main article of diet. A bag of wheat was a regular part of the outfit. It was whole wheat, not flour. When the soldier was hungry, all he had to do was to eat it by chewing it whole on the march; or at a halt, or in camp, soaking it in water, and then rubbing up with a stone, eat it either uncooked, or boiled. Any of the animals he might chance to find were caught and appropriated as additional food, and were so much clear gain. There might be at stationary camps other articles of diet, but in the long run unbolted wheat was his principal food. This being the case, it is clear that open air life and wheat are, or were, the elements that can make a perfect physical organization. It is not here asserted that no other combination of fresh air and food does not furnish the same food data; but it is desired to emphasize that wheat has the undisputed character of a perfect food. Dr. Nichols, the editor of this journal, says he entertains the profoundest respect for a grain of wheat: "It is a most marvellous combination of substances, admirably adapted for the building up and sustenance of the tissues of the human body." It is emphatically the food of mankind. Its history is traced back to the earliest ages. It has been found buried with the mummies of Egypt. Our modern civilization has adopted it, or rather preparations from it. The raising of wheat and carrying it to market occupy the attention of large portions of the human race. Last year it took two hundred and twenty-five full-sized ships to carry the surplus crop of California wheat to the markets of the world. The manipulation and consumption of flour from wheat furnish employment for a much larger number of people than the producers and freighters; and if we include those who eat the food prepared from wheat and wheat flour, there is hardly an individual in any civilized community throughout the world who does not come into the most intimate relations with bread, pies, cake, puddings, gruels, crackers, muffins, dumplings, etc., all derived from wheat. The consumption of flour as food being so universal and large, may we not be allowed to infer that the characteristics of the tissues of the bodies of our race must be determined in some measure by this flour? because these tissues are built up, nourished, and sustained by the food which is consumed.

The old Roman soldier was a perfect animal in organization; and may we not deem it reasonable to conclude that his diet may have made him, or that he could not have attained his condition without his wheat or some other analogous grain? What diseases were prevalent among his comrades we know not, as no hospital records have been handed down to us. In the face of what we know and have already stated, may it not be admitted that generally he enjoyed good health? for no sick or diseased soldiers could have done the work that was accomplished.

Now, of what did his wheat food consist? From tables published in Johnson's "How Crops Grow," — a most interesting and valuable book, deserving a place in every library in the land, — we ascertain the following: —

Composition in 1000 parts of substance of

	Water.	Ash.	Potash.	Soda.	Magnesia.	Lime.
Wheat grain	143	17.7	5.5	0.6	2.2	0.6
Fine wheat flour	136	4.1	1.5	0.1	0.3	0.1

	Phosphoric Acid.	Sulphuric Acid.	Silica.	Sulphur.
Wheat grain	8.2	0.4	0.3	1.5
" flour	2.1	0 0	0 0	0.0

Amount of starch in wheat	59.5 per cent.
" " " " flour	68.7 " "
Albuminoids in wheat	13 " "
" " flour	11.8 " "

It will be seen that there is a considerable withdrawal of mineral elements in flour, while the starch is about the same. The withdrawal of potash is 5.5—1.5=$\frac{4}{5}\frac{0}{5}$, not quite $\frac{4}{5}$; of soda, 0.6—0.1=$\frac{5}{6}$; of magnesia, 2.2—0.5=$1\frac{7}{2}$; of lime, 0.6—0.1=$\frac{5}{6}$, the same as of soda; of phosphoric acid, 8.2—2.1=$\frac{6}{8}\frac{1}{2}$, almost $\frac{7}{8}$.

Note that phosphorus or phosphoric acid is found largely in the albumen of the nervous tissues. It is also found in the bony tissues.

Chemical constitution of nerve (Vangeala): —

Albumen	7.00
Fat	5.23
Phosphorus	1.50
Osmazome	1.12
Acids, salts, sulphur	5.15
Water	80.00
	100.00

Albumen is found solid in nerves. Its composition, according to Scherer, is as follows: —

Carbon	54.9
Hydrogen	7.0
Nitrogen	15.0
Oxygen, Sulphur, Phosphoric acid	22.4

Here there is a withdrawal in flour of nearly seven eighths of the proper nerve food found in the wheat, the main ration of the old Roman soldier. It is probably the soluble and assimilable form of phosphates, one that the digestive system can absorb and the nutritive system appropriate to its sustenance. Thus modern civilized mankind are generally living upon a food which is deprived of seven eighths of its nerve producing, sustaining, and corroborating element, *phosphoric acid.*

We raise the question seriously which stands at the head of this article, Does the use of flour promote (that is, assist, predispose to) affections of the nervous system? Mark, we do not ask whether it is the sole exciting cause, but whether if mankind now received in its bread eight eighths of phosphoric acid, instead of one eighth, there would not probably be less disease of the nervous system.

Eight eighths were designed for man's use by the Creator. Eight eighths gave the Roman soldier his nerve energy and muscle. Suppose he had had only flour bread, and got one eighth; would he not have sensibly suffered? Could he have carried his sixty pounds of baggage? Indeed, we find that the absence of what Cæsar calls *frumenta,* corn or grain (not our maize or Indian corn, which was then undiscovered) *par excellence*, or wheat, from their ration, was the cause of tumults, disturbances, and sometimes war. Suppose Cæsar had started a first-class modern flour mill, and separating almost seven eighths of the nerve food from their wheat, had fed his soldiers with the unnatural manufacture; may not we be allowed to think there would have been equal trouble? For one cannot imagine such a large diminution without a corresponding lack of tonicity in those tissues needing and accustomed to a full supply. To put it differently, suppose Cæsar had removed 87½ per cent. of his soldiers' proper nerve food from their wheat; would he not have had a right to expect only 12½ per cent. of energy, tone, or vital force in those soldiers' nerves? And yet this is just the state of things our boasted modern civilization has put us into. Because public opinion says that the whiter and lighter the bread is baked the better it is, therefore all Christendom acknowledges the declaration, and eats the food, which contains the less of solid, substantial elements the whiter and lighter it is. It cannot be denied that neurotic complaints are very common and chronic. Never were there so many insane people; never were physicians called upon oftener to treat nervous diseases than at present. How often people drop dead from heart disease, found upon examination to be solely from the want of proper innervation. How marked is the prevalency of paralysis. How the nerves of special sense suffer. We have trouble with the eyes very commonly. Our children, if we have any, grow up thin, ethereal, *nervous*, anæmic. They die of consumption, and break down readily under the discipline of schools. Then see what a vast amount of nervous diseases in women in every condition and class of society. Go into any public assembly in New England; see the cry of distress and care impressed upon the countenances, a cry for something they lack. It is a beseeching look. Some say it is from hard work! Well, it is hard work to fight the battles of life with but 12½ per cent. nerve food!

May it not be that the diet of our farmers, *white bread, pies, cakes, doughnuts, crackers*, deficient as they are in the full amount of nerve food, is partly the cause of their own and particularly their wives' decay, and distressed looks, and decayed teeth, and weak nerves, that tremble and shake and ache when engaged in services which should be pleasurable, not painful? Consider also the amount of nerve force it takes to digest the starch which is a main constituent of flour, compared with the amount required to digest animal food containing the same amount of nerve food. Sometimes cases of dyspepsia (difficult digestion) seem to depend upon the fact that the nerve power (so scantily fed upon flour) is all used up in labor and work, and in carrying on the other functions of the body, so that there is none left to digest the food. In other words, the system is too tired to eat. What follows? As a matter of course, the whole system is unnourished, the other functions fail in their full performances, and if this be carried too far the nervous system rebels and we have neuralgia, headaches, and distress in various parts of the body; and if these things be continued, disease results, sometimes followed by death.

The fact is that we are surrounded constantly by the causes of disease. Vegetation is subject to the same law. The moment animal and vegetable systems are reduced in their vitality, then step in parasites, animal and vegetable, which are called disease. In potatoes, for instance, that rot, it has been found that there is a withdrawal of lime to nearly 75 per cent. of the normal quantity. The aphides and fungi and microscopic algæ prey upon the tubers, and by some are thought to be the cause of the potato rot; but as they are found wherever there is decay, animal or vegetable, it is more probable that the loss of the mineral constituents so weakened the vitality of the potatoes that they fell an easy prey to the insects and spores which are everywhere present, ready to act if they get a chance. Our present system of agriculture allows the ground no time to rest, and when the soluble salts of mineral plant food are exhausted from the soil, plants grown in that soil cannot get their proper mineral food. The old Mosaic law of letting the ground enjoy the rest of a sabbatic year (one in seven) allowed the undissolved lime, soda, potash, magnesia salts, etc., to become soluble under the atmospheric influences, so that when the land came to be planted the next year, it possessed the materials in a soluble form for making growths with their full amount of mineral constituents. Thus built up, the plants resist the aphides and the fungi, and, as people say, they do not rot.

Dr. Nichols, the able editor of this paper, said that when he gave his land a dressing of salts (sulphate of magnesium), then it bore perfect wheat, while before it was a failure. The same gentleman has a cold grapery in which he raises large quantities of perfect and most beautiful fruit, entirely free from rust, mildew, smut, mould, or insects. The peculiarity of this grapery consists in having no manure but mineral manure in the form of salts of the various alkaline earths. The supply was put in the border outside, and is calculated to last for thirty years! Eight of these years have passed, and the abundance, perfection, and beauty of the fruits are a growing and indisputable comment upon the doctor's wisdom, and the law of the indispensableness of mineral food to perfection in vegetation.

If mineral salts are so necessary to healthy vegetation, is it unfair to reason that animal life needs them just as much? And as nerve force is so indispensable a part of animal life, do we reason incorrectly when we assert that in our opinion nervous disease would not be so prevalent, if the human system was fed with all the 100 per cent. of phosphoric acid that God intended it should have? Ours is such a bustling, active, nervous age, that we need more nerve food than ever before in the history of the world. How many of us wear out, how many of us suffer, how many of us fail, from want of proper nerve food none can tell. One thing is certain: the old Roman soldier did not give out until the introduction of wealth brought on an age of the most extravagant living the world ever saw. If the diet and habits had been kept down to the wheat standard in the palmy days of the empire, Rome too might have withstood decay (other things being equal) a much longer time. And what perpetuity can we expect for our own country, if we rear a weak race with feeble nervous systems on food which has lost nearly 87½ per cent. of phosphoric acid?

This subject is one of importance. If the case has been made out even feebly, public opinion should be moulded in the right direction. This can be done only by united, continuous effort of right-minded people. Let these when convinced say so, and become centres around which opinion may crystallize.

CONCERNING SNOW.

A FEW words about snow may form an appropriate supplement to what we have already said concerning rain.

When the atmospheric vapor is precipitated at a temperature of 32° F., or lower, it is condensed in a solid state without passing through the intermediate condition of a liquid, and usually assumes a crystalline form. Snow flakes are made up of these minute ice crystals, and generally take the shape of six-pointed stars. More than a thousand varieties of these have been observed and figured, a few of which are shown in the accompanying cut.

The crystals of the same fall have generally the same, or nearly the same, form. Some young friends of ours used to make drawings of the crystalline "pattern" of each snow-storm during the winter, and the entire series for the season formed a very pretty collection. The forms can often be made out with the naked eye, if the flakes are caught on a dark surface, as a piece of black cloth, but a magnifying-glass of moderate power shows them much better. Of course they must be examined out-of-doors, or in a very cold room. The flakes vary in diame-

ter from .07 of an inch up to about an inch, being smaller in proportion as the temperature is lower. Sometimes the falling flakes are tangled together into what may be called a natural snow-ball, one or two inches in diameter. Much larger balls are sometimes formed, especially on the slopes of the Alps in Switzerland, by the action of the wind upon the snow after it has fallen. Cylindrical masses full three feet in diameter have been rolled up in this way.

The whiteness of snow is due to the combination of the different prismatic rays from the minute crystals. In pounded glass we have a similar effect, and also in spray or foam. Snow is also feebly phosphorescent, as is evident from the fact that in the darkest nights it appears more luminous than the sky. Its light cannot therefore be that reflected from the sky. Some of the standard authorities on the subject assert that if on the morning of a clear day we cover a portion of the snow with an opaque screen, and uncover it at night, this portion will be less luminous than the surrounding snow which has been exposed all day to the sunlight. If this be true, it proves beyond a doubt that snow, like many other substances, has the power of shining in the dark after being exposed to a bright light; that is, it retains a part of the light it has received, and gives it out gradually afterwards.

Red snow is occasionally seen in Alpine and polar regions. It has been proved that it owes its color to certain microscopic plants. The red snow plant is known as the *Protococcus nivalis*, and in its mature state consists of "brilliant globules like fine garnets, seated on, but not immersed in a gelatinous mass." From the motions of the plant in its earlier stages, some naturalists formerly believed it to be an animalcule, but no doubt is now entertained of its vegetable nature. Captain Ross once observed this red snow extending along the shore of Baffin's Bay for a distance of eight miles, and the color penetrated in some places to the depth of twelve feet. The *green* snow which has been observed in Spitzbergen is probably colored by some similar vegetable growth.

Snow has often been called "the poor man's manure," and recent researches have shown that it absorbs from the air an appreciable amount of ammonia, which it imparts to the soil when it melts. From its loose texture and the amount of air it contains, — usually about ten times its own bulk, — it is a very bad conductor of heat, and thus keeps the earth warm by checking the radiation of its heat. In extreme cold weather, the soil is sometimes 40° warmer than the surface of the superjacent snow. In mountain countries the snow by melting and flooding the rivers carries fertility into districts that would otherwise be barren wastes.

SUICIDE AMONG SCORPIONS.

In a recent number of *Nature*, Mr. G. Bidie records the following fact with regard to the common black scorpion of Southern India: —

One morning a servant brought to me a very large specimen of this scorpion, which, having stayed out too long in its nocturnal rambles, had apparently got bewildered at daybreak, and been unable to find its way home. To keep it safe, the creature was at once put into a glazed entomological case. Having a few leisure minutes in the course of the forenoon, I thought I would see how my prisoner was getting on, and to have a better view of it the case was placed in a window, in the rays of a hot sun. The light and heat seemed to irritate it very much, and this recalled to my mind a story which I had read somewhere, that a scorpion, on being surrounded with fire, had committed suicide. I hesitated about subjecting my *pet* to such a terrible ordeal, but taking a common botanical lens, I focused the rays of the sun on its back. The moment this was done it began to run hurriedly about the case, hissing and *spitting* in a very fierce way. This experiment was repeated some four or five times with like results, but on trying it once again, the scorpion turned up its tail and plunged the sting, quick as lightning, into its own back. The infliction of the wound was followed by a sudden escape of fluid, and a friend standing by me called out, "See, it has stung itself; it is dead;" and sure enough, in less than half a minute life was quite extinct. I have written this brief notice to show, (1) That animals may commit suicide; (2) that the poison of certain animals may be destructive to themselves.

There is no doubt that the scorpion will sometimes commit suicide, and we have personally known of one instance of the kind. The only scorpion that we happened to see during a brief visit to the Isthmus of Darien, last November, was one which Mrs. Corwine, of Panama, gave to a friend in our party. She found the creature in her chamber, and chased it round the room with a slipper, until at length it became so exasperated that it turned its tail against itself, and died almost instantly. Her account of the behavior of the animal, as it grew more and more angry, agreed essentially with that given above. It would seem that it is sheer fury that prompts the suicidal act. The scorpion gets so "mad" that it must vent its venomous rage upon something, even if it be upon itself.

This particular scorpion was about three inches long, and black, or nearly black; but to which of the many species of the animal it belonged we do not know.

THE SCIENCE OF ADULTERATION.

BY S. P. SHARPLES, STATE ASSAYER.

III.

There are certain stages in fraud at which the public stop condemning the actor, and are lost in admiration at his audacity. Certain of the soap-makers have passed the stage of secret adulteration, and actually glory in their skill in palming off upon an innocent and unsuspecting public articles which are soap only in the name.

At the very outset of our investigations we are met by the fact that a pound of soap weighs but 12 ounces. This is said to have been first discovered by an enterprising New York firm, which sold to the grocers 75 lbs. of soap neatly cut into 100 pieces. They did not wish to undersell their friends nor to commit any fraud; they merely explained to the grocer how he could sell a pound of soap for less than his neighbor, and thus secure trade. This is a comparatively new fraud, and one that has in a measure cured itself, because the price corresponds now to the weight.

An older idea than this is adulteration with water. Other things being equal, the man is most successful in the business who can incorporate the most water in the soap and still have it retain its form. This adulteration can easily be detected by drying it, first at a gentle heat and then at 212° F., having previously reduced the soap to fine shavings.

The next adulteration, and one which has many defenders, is the use of rosin instead of fat in the manufacture of the soap. This use of rosin seems to have arisen in the first place from the fact that rosin was cheap and could be readily mixed with the soap. A rosin soap is first made by dissolving the rosin in sal soda or caustic soda, and then mixing the soap thus formed with ordinary tallow soap. Some of the most expert at this business have succeeded in thus introducing 75 per cent. of rosin to 25 per cent. of tallow. This, with rosin and sal soda at about 2½ cents per pound, while the soap sells for 5 or 6, yields a reasonable profit. But it may be safely asserted, and the assertion will be sustained by the best soap-makers, that rosin is of no benefit in a soap and is often a positive injury. The detection of rosin is comparatively easy, as it always betrays itself by the smell. The quantitative estimation of it is, however, quite difficult, and it can only be done by a chemist.

Another common adulterant is finely ground talc or marble dust. These are mere make-weights, and there is no reason for their admixture. I recently heard of a manufacturer who boasted that he had been able to introduce over 65 per cent. of adulteration in his soap, exclusive of the rosin.

A good hard soap should not contain over 20 per cent. of water; should dissolve completely in hot water, giving a fluid that is nearly clear; and should have no disagreeable smell.

The artificial oil of bitter almonds is often added to soap to conceal the poor quality of the tallow. Some makers are in the habit of incorporating considerable quantities of carbonate of soda or sulphate of soda in their soaps. These are cheap, and also enable the soap to hold much more water. If too much of either is used, it is apt to effloresce and appear as a white incrustation on the surface of the soap. These salts are easily recognized by the appropriate tests. A drop of acid causes the carbonate to effervesce. If the soap is dissolved in a little hot water, and the fats precipitated with hydrochloric acid and filtered, chloride of barium will show the presence of sulphate of soda in the filtrate.

FAMILIAR SCIENCE NOTES.

Emission of Carbonic Acid by Leaves. — The phenomena of decomposition of carbonic acid by leaves under the influence of light are well known. The inverse phenomena, namely, the absorption of oxygen and the emission of carbonic acid in the dark, has attracted much less attention. MM. Deherain and Moisson have just communicated to the Paris Academy an interesting memoir on the subject. They find from experiment that the quantity of carbonic acid emitted by leaves is comparable to that furnished by cold-blooded animals; frogs give, in respiration, a quantity of the gas much below that from leaves of tobacco, or mustard, or sorrel. The quantity that leaves emit increases with rise of temperature, and at 59° F. the respiratory activity of silkworms is comparable to that of decayed leaves at 86° F. but considerably higher than these manifest at 59° to 68° F. Leaves kept in the dark, moreover, absorb oxygen greater in volume than the carbonic acid they emit, and they continue to emit carbonic acid in an atmosphere deprived of oxygen.

The Music of Waterfalls. — A German scientific journal reports some observations on the

tone of waterfalls, made by A. and E. Heim, and communicated to the Natural History Society of Schaffhausen. They say a mass of falling water gives the chord of C sharp (C, E, D), and below these notes the non-accordant F. When C and D sound louder than the middle note, F is heard very fully. It smothers the pure chord of C sharp, so that it is no longer heard as a concord but as a clear, rushing noise. The F is a deep, dull, humming, far-resounding tone, strong in proportion to the mass of the falling water. It can be heard round rocky corners or through thick woods, and at a distance at which the other notes are imperceptible. Besides F, C and G are heard. E is always weak, and the ear scarcely recognizes it in small falls. The notes C, E, G, F belong to all rushing water, and in great falls often in different octaves. Small falls often give the same tones one, two, or three octaves higher. No other tones can be found. In strong falls F is the easiest to hear; in all weak ones C. On first attempts to distinguish the notes, C is usually the most readily recognized, and as each note is accompanied by its octave, it is often difficult to decide which C, G, or F is heard. Persons with musical ears attempting to sing near a rushing water spontaneously use the key of C sharp, or of F sharp if near a heavy thundering fall. Other keys give an ugly discord.

A Simple Glycerine Thermometer. — This instrument, suggested by A. Jaksch, of Bohemia, is made as follows: An ounce bottle is two-thirds filled with glycerine of any desired color, and the bottle placed in a freezing mixture of sal-ammoniac, saltpetre, and water, so as to cool the liquid to 32° F. A glass tube twelve to fifteen inches long is passed through a good-fitting cork, so as to dip nearly an inch into the glycerine. The cork is inserted in the bottle and rendered air-tight with sealing wax or a cement of varnish and chalk, and the thermometer is then ready to be graduated. On inserting the cork, the liquid rises in the tube a few inches. The bottle is placed in melting ice, and the level of the liquid marked 32°, if the scale is to be Fahrenheit's. It is next placed in warm water, say at 132°, and this point marked. The space between these points is divided into one hundred equal parts, and this division carried down to the Fahrenheit zero, and upward to the top of the tube.

CULINARY RECIPES.

Apples in Imitation of Ginger. — To three pounds of very hard apples take two pounds of loaf sugar, and a quarter of a pound of best white ginger. Put these in layers (having first sliced the apples in eight pieces and cored them) alternately in a wide-mouthed jar. Next day infuse an ounce of white ginger, well bruised, in about a pint of boiling water; let it stand till the next day. Then put in the apples that have been two days in the ginger. Simmer slowly until the apples look clear. Take great care not to break the pieces.

The following is another recipe, which we find in the London *Garden:* For 4 lbs. of apples take 4 lbs. of sugar, one quart of water, and 2 oz. of best essence of ginger. First pare the fruit, cutting out every particle of core; then shape it to resemble the small kind of preserved ginger. Boil the sugar and water nearly twenty-five minutes, until it is a nice syrup, then put in the apples; be sure not to stir them much; add the essence of ginger (if 2 oz. be not sufficient, add more). It will take nearly an hour to boil, until it becomes yellow and transparent. There will be some pieces that will not clear; put them by themselves, as they will spoil the look of the rest. It will require skimming.

German Apple Pudding. — Butter a pie-dish, and lay in it a layer of bread crumbs, then a layer of good cooking apples pared and quartered, then a layer of good brown sugar, then a very thin layer of finely-chopped suet or little bits of butter, then a layer of bread crumbs, and so on until the dish is filled, taking care to have crumbs at the top. Bake the pudding in a moderate oven for three quarters of an hour. Before serving, sift sugar on the top.

Potatoes à la Duchesse. — The following is the recipe of a good cook in a private family in Paris: Take five middle sized cold boiled potatoes, grate and mix them with five dessert-spoonfuls of flour and a half-penny worth of milk, adding to the mixture two eggs well beaten up; prepare a panful of boiling fat, and drop spoonfuls of the paste into the fat, taking them out the instant they have acquired a delicate golden-brown color. With moderate care potatoes thus cooked are delicious.

Practical Chemistry and the Arts.

STOVE COMPETITION IN ENGLAND.

There is no useful art in which less progress has been made for the last century than in that of heating our houses, and no one certainly in which there is greater room for improvement. We hoped that the recent competition for the prizes offered by the Society of Arts in London for the best stoves might lead to some valuable results, but this, we are sorry to say, was not the case.

In July, 1872, the sum of £500 ($2500) was given to the Society of Arts by a gentleman who did not wish his name to be disclosed, "to encourage the development of improved means for the economic use of fuel in private dwellings." After due consideration, it was decided to offer a series of prizes for the best stoves, of certain specified classes. Out of 204 articles offered for the competition, 107 were selected as worthy of being tested, and a period of 142 days was spent in this work by an able committee. As there were six rooms in use at the same time, this allowed eight days for each stove. After carefully tabulating and comparing the results, the committee have issued their report, in which they express the opinion that none of the articles offered are worthy of a prize. They do not appear to consider any of the stoves as even deserving to be mentioned with commendation.

From the comments on the competition in the English scientific journals, it is evident that, though they are disappointed at the result, they have no fault to find with the committee, but fully endorse their fitness for the task assigned them, and the care and thoroughness with which they have performed it. The following is an extract from a long article on the subject in *Iron*, and the statements it makes are as true here as in England: —

"As regards open grates for warming and ventilating, the finding of the committee goes to confirm a suspicion widely felt among those who have directed scientific opinion to the subject, that we have made scarcely any improvement on the practice of Count Rumford's days, absolutely none on the principles he enunciated. However incredible the assertion may appear, we question if two or three per cent. of the heat actually available in the fuel is utilized. It is admitted that about half the heat generated by combustion is used in maintaining the combustion, that is, in the oxidation of the carbon. The remaining half, if we could get hold of it properly, we ought to avail ourselves of for warming our rooms. In an open grate, the experiment of testing the heat of the chimney, and comparing it with the heat of the room, shows that the amount radiated into the room is as nothing compared with that sent up the chimney. If we are correct, and only a careful and accurate series of experiments can confirm or disprove the suggestion, there is here a subject which demands immediate inquiry and elucidation. The fact seems to be that we are still in a state of the densest ignorance as to the true principles of warming and ventilating our houses. It is only by mere accident that we ever succeed in getting proper ventilation in a building at all. We know next to nothing of the principles which really govern the action and the direction of currents of air. In nine large buildings out of ten, where any attempt has been made at ventilation, we have columns of cold air descending, and columns of hot air ascending, in the midst of an otherwise stagnant pool. It is only after years of costly failures that we have got our Houses of Parliament properly ventilated. The frequenters of theatres, concert rooms, and other places of public amusement, know with how little success our architects endeavor to get foul air out and pure air in. In our dwelling-houses it is the same. We endeavor to guide and direct the currents of air, but the fact is we do not know where the air comes from or whither it goes. Measure the amount of air going up the chimney with a brisk fire, and you will find an immensely greater proportion going up than you can discover entering the room at any available apertures. The experiments of Pettenkofer go to show that most of the air which enters a room filters through the walls, and does not merely come in by the ordinary openings. The only thing that is certain about the matter is that we are altogether working in the dark. We must have more information, and that soon."

Here, surely, is a field for Yankee ingenuity; though what would seem to be first needed is that some one should take up the scientific investigation of the subject where Rumford left it. It is not until some advance has been made in the science, that we can hope for any material improvement in the art of heating. After the principles are better understood, we may look for some progress in their practical application.

LABORATORY NOTES.

Extract of Litmus. — According to German authority, the coloring matter of litmus, when purified as much as possible, may be kept for an indefinite period unaltered in glycerine. Litmus is treated with hot water, and the solution, after concentration, is mixed with a sufficient quantity of alcohol (80 p. c.) to precipitate the coloring matter. After standing for 20 hours the alcohol is poured off, and carries with it a dirty blue foreign substance, which frequently occurs in litmus and is not altered by acids. The sediment is treated with hot water, which dissolves it, on account of the potassic carbonate which is present. To remove this carbonate, sulphuric acid is added till the liquid assumes a faint wine-red tint; it is then heated to boiling for a few minutes, and again rendered blue by the addition of a few drops of lime-water. After the lapse of 24 hours the liquid is filtered and evaporated to a syrup, and left all night in a cool place, when the potassic sulphate crystallizes out in the form of a crust. It is then filtered through moist loose cotton, mixed with glycerine, and carefully preserved from damp.

To Cement Metal on Glass. — The following cement, recommended by Franke for fastening prize medals, etc., on the glass of show-cases in the Vienna Exhibition, may be found generally useful in fastening metal on glass securely and rapidly. To an intimate mixture of two parts of finely powdered silver litharge and one part dry white lead, add as much of a mixture of three parts boiled lin-

seed oil and one of copal varnish as will form a doughy mass. It is only necessary to cover the face of the medal with this cement, press it upon the glass, and remove the excess of cement.

Test-Papers. — The following is an extract from an article on this subject by F. Mohr, translated in the *Journal of the Chemical Society*: —

Paper containing starch moistened with a solution of potassic iodate in oxalic acid and dried is turned blue by reducing agents, such as sulphurous acid, hyposulphites, sulphuretted hydrogen, potassic sulphocyanate, ferrous oxide, cupric chloride, potassic iodide, and similar bodies.

For oxidizing bodies, a starch paper with potassic iodide may be used. To keep such paper unchanged, a lighted sulphur match should be held in the bottle in which the paper is preserved, before closing it.

The author also recommends the following test-papers: For ammonia gas: paper soaked in mercurous oxide solution. For sulphuretted hydrogen and alkaline sulphides: acetate of lead paper; filtering paper soaked in cobalt chloride; polished visiting cards, or paper painted with bismuth white. For metals which give black precipitates with sulphuretted hydrogen in acid solution, washed sulphide of zinc precipitated from the acetate is smeared on writing paper and dried. Any mineral acid decomposes the sulphide of zinc, setting free sulphuretted hydrogen, which immediately precipitates the metals present.

NOVELTIES FROM ABROAD.

Nautical "Plasters." — Some ready means of stopping holes made in ships by collision or otherwise is a desideratum, and an officer in the Russian navy has been exercising his inventive skill to that end. His invention consists of a "plaster," as he calls it, made of two rectangular sheets of canvas sewed together, bordered with rope, and containing a water-proof material. A sounding-line has to be passed under the keel and brought up on the other side; then the plaster can be lowered to the hole and made fast. The lieutenant has published his article at the suggestion of Admiral Boutakow, who bears his testimony in favor of the invention, citing several cases in which it has been employed with advantage in ships of the Russian navy. A large number of these ships are now furnished with it. It is recommended that men be specially trained and ready for the manœuvring of the apparatus in each ship.

Something New about Sand. — According to M. Beaudemoulin, if a quantity of dry sand be placed in a box of thin sheet iron or even in a canvas bag, and subjected to a slight compression, it forms a mass capable of resisting a pressure of fully 60 tons without breaking or even straining the envelope. The sand, however, remains perfectly divisible, so that if a small hole be made in the box or bag it will flow slowly, and with so little force that even a small piece of paper pasted over the opening will check the flow, even with the 60 tons' weight upon it. M. Beaudemoulin thinks this discovery of his may be utilized for building purposes, since the filled boxes need merely be held in place by a framework; while being very thick they would form a protection, in case of being used for dwellings, against variations of temperature. Such walls, besides, would be fireproof. It is also suggested that for lowering heavy weights, or even entire buildings, which, by a change of street levels have been left too high above the roadway, the sand bags could be placed beneath and their contents allowed gradually to escape, thus letting the load slowly settle down.

A Striking Sundial. — A sundial that strikes the hours has been invented by Abbé Allegret. It is simply a modification of what is termed the solar counter, for registering the times at which the sun shines or is obscured. To effect this there are two balls, one black and the other yellow, fixed at opposite ends of a lever sustained by a central pivot. When the sun shines the black ball absorbs more heat than the yellow one, and the vapor of a liquid contained in the former is elevated to a higher temperature than that in the latter. As a result the vapor leaves the one ball, and being condensed in the other, this becomes the heavier, overbalances the equilibrium, and in doing so sets free a weight, giving motion to the requisite clock-work. In the sun-dial referred to, a pair of these balls is fixed at every hour-mark. When the shadow of the gnomon reaches any particular hour-mark one of the balls is shaded, a preponderance of liquid enters the ball, the lever tilts, the mechanism is set going, and a gong sounded as many times as the number of the hour to be indicated. Of course the sun must shine at the time of the hour-mark being passed by the shadow, or the time will not be struck.

PRACTICAL RECIPES.

Stains for Wood. — The following are given in the London *Chemist and Druggist*: *A Green Stain.* — Take 3 pints strong vinegar, 4 ounces best verdigris, ground fine, ½ ounce sap green; thoroughly mix these ingredients. *A Purple Stain.* — Take 1 pound of chipped logwood, 3 quarts water, 4 ounces pearlash, and 1 ounce powdered indigo; boil the logwood in the water for half an hour, then add the pearlash and indigo. *A Cherry Stain.* — Take 3 quarts rain water, 4 ounces annatto; boil in copper kettle till the annatto is dissolved, then put in a piece of potash of the size of a walnut; keep the mixture over the fire half an hour longer, and then it may be bottled for use. *A Mahogany Stain.* — Wash the wood with diluted nitric acid (ten parts of water to one part of nitric acid); for rosewood, glaze the same with carmine or Munich lake. Asphaltum, thinned with turpentine, forms an excellent mahogany color. *A Blue Stain.* — Dissolve copper filings in aqua-fortis; brush the wood with it, and then go over the work with a hot solution of pearlash (2 ounces to 1 pint of water) till it assumes a perfectly blue color.

Imitation of Tortoise-Shell. — The appearance of tortoise-shell may be given to horn by brushing it over with a paste made of two parts of lime, one part litharge, and a little soap-lye, which is allowed to dry. This acts by forming sulphide of lead with the sulphur contained in the albumen of the horn, producing dark spots, which contrast with the brighter color of the horn.

Cleaning Brass. — If very much oxidized or covered with green rust, first wash it with strong soda and water. If not so very bad, this first process may be dispensed with. Then apply a mixture of one part of common sulphuric acid and twelve parts of water, mixed in an earthen vessel; wash well, first with clear water, and then with water containing some ammonia, afterwards scouring well with oil and rotten-stone, and using a piece of soft leather and a little dry rotten-stone to give a brilliant polish. In subsequent cleaning, oil and rotten-stone will be found sufficient.

Red Marking-Ink for Clothing. — A red ink for marking clothes, which is not attacked by soap, alkalies, or acids, is prepared by Welger as follows: Enough finely pulverized cinnabar to form a moderately thick liquid is very intimately mixed with egg-albumen previously diluted with an equal bulk of water, and beaten to a froth, and filtered through fine linen. Marks formed on cloth with this liquid by means of a quill are fixed after they have become dry by pressing the cloth on the other side with a hot iron. The ink will keep in well-closed bottles for a long time without separation of the suspended cinnabar.

Agriculture.

AGRICULTURAL STATIONS.

The readers of agricultural literature, as it comes to us from the other side of the water, hear much concerning "Agricultural Stations" as they exist in France, Germany, and elsewhere. The character of these stations, and the nature of the work performed in connection with them, are not clearly understood. The first station established in Germany was in 1851, and it is still in existence, and one of the best managed in the empire. Twelve more were established from 1851 to 1861, and since the latter date 26 have been founded, making 38 in all. In France the first station was founded in 1858. It was amalgamated with a school of forestry, and is in connection with a large university. In 1872 the first was founded in Belgium, and in 1872 also the first in Italy. There are now nine stations in the latter country. In Switzerland six have been established, and there they have stations devoted to milk, cheese, and other milk products. The chemistry of these, the most important products of the district, is carefully studied. There are two in Sweden, and one has been founded in Holland.

Now what are the objects of an agricultural station? It is rather difficult to arrange them, because there are stations which have become limited to single objects. A station in a forest district devotes itself especially to the study of forestry. In the South of France and in Italy others are devoted to the treatment and manufacture of products derived from the vine, tobacco, silk, etc. There are some 10 or 12 stations which are entirely absorbed in the study of such products, and of olives and olive-oil. The objects of an agricultural station may, however, be arranged as follows: (1) objects which are of a definite scientific character: experiments on vegetables, on earth and soil, and on the treatment of the products; (2) the development and feeding of animals, researches upon newly discovered materials, the analysis of soils, of food, and of waste products. One of the most important, because most practical, of the objects which the station has in view is (3) the control of the artificial manure manufacture. At one of the agricultural stations in Germany in 1867 the amount of manure analyzed for manufacturers in the neighborhood was in value $675,000. That was the value of the manure sold under the guarantee of the station. The manufacturer makes a contract with the station, by which the professors are allowed at any time to come to the warehouses, and take any samples they like, to seal them up in the presence of witnesses, and to analyze them, and then, if found correct, they are sold under the guarantee of the station. The results are published by the authorities, so that the farmer has a public guarantee instead of a private one. The field experiments are not confined to the station alone, but the station is in correspondence with others all over the country, and similar experiments are carried out in many parts of the empire of Germany at the present time.

The fourth object of the station is the teaching department. In many cases the professors take a tour in the district, and give lectures and hold conferences, and in this way they spread a

knowledge of the facts gathered in the preceding year by the work of the station. The training of agricultural chemists is also practised, and they issue reports and publications, which make known the progress made in scientific agriculture.

The fifth object of the station is meteorological observations. The weather, rain, temperature, and wind are recorded, and conclusions are arrived at for the guidance of agriculture.

Agricultural stations in a modified form, if established in this country, would do a large amount of good. After twelve years spent in conducting farm experiments in a practical way, we have reached some conclusions regarding the best form of aiding agriculture by schools of instruction, the particulars of which will be presented to our readers at a future time.

NITROGEN IN PLANTS.

Considerable confusion exists among farmers regarding the nature of nitrogen, an element which enters largely into the composition of the cereal grains, and which is therefore an important constituent in fertilizing materials. So imperfectly is its nature understood as associated with fertilizers, that we have frequently received inquiries regarding its cost per ton, and how it could be packed for transportation. It should be understood that nitrogen is a gaseous body, and that it cannot be used for crops except as it is combined with other bodies in the form of acids or salts. Nitrogen is estimated to be worth, in form adapted to the assimilating powers of plants, about 27 cents per pound at present market rates of ammonia and nitrogenous salts; but in its simple form of gas it can be had for nothing from the atmosphere, by burning the oxygen in association with it, under certain conditions.

It is impossible to produce upon our farms the rich grains without nitrogen. The important experiments of Messrs. Lawes and Gilbert in England shed a flood of light upon the nature and value of this agent in agriculture. Nitrogenous manures are of primary importance if luxuriant cereal crops are to be raised, the natural supply of combined nitrogen from the atmosphere being very small, and the crops in question having little power for assimilating the forms of nitrogen chiefly present in the soil. As nitrogenous manures are very expensive, it is a matter of great importance to employ them in the most economical manner. Messrs. Lawes and Gilbert, knowing the composition of the manure that has been put on their fields, and the composition of the crops that have been carted off, can tell exactly what proportion of the nitrogen applied has been assimilated by the plant. They find, on an average of twenty years, that wheat assimilates about 45 per cent. of the nitrogen in a spring dressing of nitrate of soda, and about 33 per cent. in an autumn dressing of sulphate of ammonia, and only 14½ per cent. of the nitrogen supplied by farm-yard manure. With barley, the proportion assimilated is rather greater, being 49 per cent. for a spring dressing of ammonia salts.

What becomes of the large proportion of unused nitrogen? Analyses of the soils, and of the drainage water, throw much light on the subject. The soils of the wheat-field have been analyzed down to a depth of 27 inches. A considerable part of the missing nitrogen is found in the soil, but since it has scarcely any effect on the crops, it is apparently in some state of combination unsuitable for the use of plants. The examination of nitrates found in the drainage waters from the different plots leads to the belief that in the case of ammonia salts, and nitrate of soda, the loss of nitrogen chiefly takes place in this manner. Chemists, knowing that ammonia is readily absorbed and firmly held by soil, had never anticipated that so considerable a loss might occur by drainage. It plainly appears, however, from these results, that ammonia when applied to the soil is quickly converted into nitric acid, and in heavy rains may be easily washed out. During autumn and winter there is little evaporation from the soil, and no consumption of water by a growing crop; as soon therefore as the surface soil is saturated, most of the subsequent rain-fall will pass into the subsoil, or find its exit through the drains. If the drainage water contains 1 part of nitrogen in 100,000 (and many of the waters analyzed were much richer), there will be a loss of nitrogen equal to about 23 lbs. of guano for every inch of rain that passes beyond the reach of the roots. It is evident from these facts that ammonia should be applied to the land only in the spring, when the crop is able to make immediate use of it. It may also be found that on gravelly and sandy soils, which have little power of holding water, organic forms of nitrogen, as farm-yard manure, may be more certain in their effects than ammonia or nitrates. The organic manures, being only slowly rendered soluble in the soil, can suffer comparatively little loss from sudden rain.

THE GREAT LANDHOLDERS OF SCOTLAND.

We find in a recent number of the London *Agricultural Gazette* a tabular statement of the Scotch landed estates that exceed 50,000 acres each, with the yearly value of the same. There are fifty-seven of them, and their gross extent is 6 719,530 acres, and their gross annual value £1,147,733, or about $5,750,000.

The richest of these great landholders is the Duke of Sutherland, whose "broad acres" aggregate 1,326,333, or more than 2072 square miles, yielding annually somewhat above a quarter of a million of dollars. Next on the list is the Duke of Buccleuch and Queensberry, with a little farm of 418,403 acres. Though only about one third as large as the Duke of Sutherland's, it appears to be almost three times as valuable, the yearly income exceeding $750,000. Sir James Matheson is third in order, having 406,070 acres, but they pay him only $85,000 a year. The Earl of Breadalbane follows, with 372,729 acres, the returns from which are nearly the same as the Duke of Sutherland's. The Earl of Fife has 252,815 acres, with a yearly revenue of $360,000. The Duke of Richmond comes hard after, with 229,612 acres, worth about $240,000 a year. Plain Mr. Alexander Matheson has 220,433 acres, yielding $100,000 or so. These are all that are above 200,000 acres, but the Duke of Athole comes near the same mark with his 195,315 acres, the revenue of which is about $200,000. The income of the Earl of Dalhousie is $270,000, though he has but 136,602 acres; that of the Duke of Argyll is $225,000, with 168,315 acres; and that of the Duke of Roxburgh $219,000, with 150,459 acres.

The largest annual value in proportion to acreage is that of the Marquis of Ailsa, being $179,000 from 76,015 acres. The smallest is that of Lord Middleton, the returns from whose 63,000 acres — almost a hundred square miles — are less than $10,000. The table does not give the extent of cultivated land in the various estates, but in many cases, especially in the Highland counties, it is of course only a small fraction of the whole.

According to the best authorities the entire territory of Scotland is 20,047,462 acres. These fifty-seven proprietors, therefore, own a trifle more than one third of the country, and almost one third of this (upwards of one tenth of all Scotland) belongs to the three richest of them.

NOTES AND MEMORANDA.

Glazed Pots for Plants. — There has been a general impression among floriculturists that plants do best in unglazed pots, but a correspondent of *The Garden* states that a leading Scotch gardener, Mr. Thomson, of Drumlanrig, entertains a different opinion. "More than half the orchids, stove plants, ferns, and even hard-wooded plants grown there are in pots which are thickly glazed from top to bottom, and the growth of one and all is wonderfully fine. The fine foliage plants are, indeed, marvels of health and bright color, and many of the orchids are unequalled in the country. Mr. Thomson informed me that, as the other plants, which are in common clay pots, require shifting, he intends substituting glazed ones, so that very shortly there will be no other kind of pots in use about Drumlanrig but glazed ones. The latter never become green or dirty-looking, and all they require in order to renew their original gloss, when soiled in any way, is a rub with a rough cloth."

Tobacco-Chewing Sheep. — In Hungary it appears that even the sheep chew tobacco, and thrive well on it, if we may believe Professor Wrightson, who made a tour through that country last year for the purpose of collecting information on the state of agriculture. In his report, published in the *Journal of the Royal Agricultural Society of England*, speaking of the Theiss district, he says: "I found tobacco cultivated on a large scale here, and learnt that sheep do very well upon tobacco in a green state as a forage crop. It is sown in the middle of March in beds, well watered and weeded, and planted out when four or five inches high, the plants being set as deep as the heart, or to where the leaves branch off from the stem."

"Insectifugal Plants." — This is the term by which M. Van Hulle, in a Belgian horticultural journal, designates certain plants which are noxious to insects. He remarks that all plants exhale various gases, and some are well known for their powerful fragrance. This odor is sometimes very attractive to animals, as in the case of *Nepeta cataria*, *Teucrium marum*, and the common valerian, so attractive to cats. He further tells us that on visiting an orchard in East Flanders, he was informed that apple-trees might be protected from the onslaught of "American blight" by simply sowing seeds of *Tropœolum majus* and allowing the plants to twine up the stem. In some parts of Belgium it is the custom to put here and there among the cabbages a plant or two of hemp, to ward off caterpillars. At Lootenhulle, M. Van Hulle saw in a vinery some plants of tomatoes against the walls between the vines. These tomatoes had been placed in that situation not so much for the sake of the fruits as for the purpose of keeping off wasps.

We give these statements for what they may be worth. The subject is one which certainly deserves investigation, for insects are the worst enemies of the farmer and horticulturist, and nothing that may help him in fighting them should be neglected.

The Lifting Force exerted by Growing Plants. — The pumpkin on which President Clarke has been experimenting at the Amherst Agricultural College has become widely celebrated for the lifting feats it has achieved. The London *Daily News* gives the following account of the work done by a smaller and more delicate plant, which seems full as wonderful in its way: "A tradesman residing in the High Street, the busiest street in Worcester, observed the other morning that a square stone on the pavement adjoining to his cellar-grating had been lifted out of place, and as a neighbor had not long before been robbed by thieves entering his premises by raising a stone of the pavement, he became somewhat alarmed, and sent for the police. After an examination, the stone, which weighed over 80 lbs., was raised, and it was then discovered that it was not a thief, but three mushrooms that had caused the displacement. The mushrooms were fine specimens 6 inches in diameter, and with unusually thick stems."

Curious Artificial Coloring of Flowers. — The *Journal of the French Central Society of Horticulture* has some curious observations on the artificial coloring of natural flowers. Flowers naturally of a violet color when exposed to the fumes of a cigar assume a green tint, all the more decided in proportion to their original brightness. This is well exemplified in the case of the violet Thlaspi or *Iberis umbellata*, and of the Julienne, or *Hesperis matronalis*. The alteration in color is due to the ammonia of the tobacco. Starting from this point the Italian professor, L. Gabba, has made a series of experiments in order to determine the effect of ammonia on the colors of various plants. Pouring a little ammonia into a plate, and placing a funnel over it, the professor inserts the flower in the tube of the latter. In this way blue, violet, and purple flowers become of a fine green color; deep carmine-colored flowers, such as pinks, become black; white blossoms yellow, and so on. But the most curious effects are produced on parti-colored flowers, such as red and white; the former color is changed to green and the latter becomes yellow. Another remarkable example is that of fuchsias with white and red flowers, which become yellow, blue, and green. When the colors have been thus changed, if the blossom be dipped in pure water it will retain the artificial color for several hours, and will afterwards return gradually to its natural tint. Another curious observation of Professor Gabba is that asters, which are naturally without scent, acquire an aromatic odor under the influence of ammonia. The same flowers of a violet color become red when sprinkled with water containing nitric acid; and, if inclosed in a wooden box and exposed to the action of hydrochloric acid gas, will in six hours become of a fine carmine color, which they will preserve if first dried in a dark place and kept dry and in the shade.

An Item for Butter Makers. — The *Western Farm Journal* gives an account of the dairy operations of Mr. Massa, residing near Nachusa, Iowa, who sold 1608½ lbs. of butter, the product for 90 days of 20 cows, or $19.01 per cow. It does not appear that there was any selection of cows made, or any effort to increase the average product. The result is given simply as that of ordinary dairy management, where particular attention is given to butter. The high prices paid for butter everywhere, and the scarcity of the article, will warrant farmers in giving particular attention to this product. The effort should be mainly devoted to securing an improvement in the quality.

Boston Journal of Chemistry.

Jas. R. Nichols, M. D., *Editor.*
Wm. J. Rolfe, A. M., *Associate Editor.*

BOSTON, FEBRUARY 1, 1875.

EVAPORATING WATER IN FURNACES.

Those familiar with what has been presented in the past volumes of the Journal, upon the important subject of water evaporation in furnaces for warming dwellings, know that the practice has been to a large extent discouraged. The reasons for this are based on experimental investigations conducted under circumstances calculated to afford reliable results. It has been found that in rooms warmed by furnace heat under proper conditions, there is present a normal or healthful amount of moisture when no water is evaporated. The results of long-continued experiments prove that if a generous volume of air is allowed to flow through a furnace, the radiating surfaces of which are not unduly heated, there is never an abnormal condition of the air so far as moisture is concerned. Theory, or the laws governing the differing capacities of gaseous bodies for moisture when heated, seems to point to a different result, but experiment disproves theory.

As regards the question where the moisture comes from, we can only say that there is a more energetic and positive diffusion of air and moisture through our dwellings than is perceptible to the senses. The intercommunication between the interior and exterior even in winter, when everything appears snug and tight, is free and constant. If our eyes were powerfully microscopic in their capacities, we should find that even brick walls were so porous that they would resemble sieves, and our wooden structures so open to air and light that we should wonder how comfortable protection is afforded from wind and rain. If air and its attendant moisture did not enter copiously by unsuspected avenues into our houses and public buildings, one half the race would die from asphyxia before reaching adult age.

It is, however, possible to conceive of conditions when artificial moisture in dwellings may be demanded. A strong current of air passing over surfaces of red-hot iron is greatly rarefied, and in that condition is thirsty for moisture. It may be presumed to be in a state where its demands are urgent and cannot be promptly satisfied without absorbing moisture from sources where it cannot well be spared. Under these circumstances injury would be best avoided by discarding the heating apparatus rather than by boiling water in its hot cavities. Any furnace designed to be used without a protection of fire-brick between the ignited coals and the iron radiating surfaces is a dangerous device, and wholly unfit for use in dwellings. The vapor from all the water in Lake Superior will not cure the evils which must flow from unduly heated air. Cast iron fire-pots without linings, whether connected with stoves or furnaces, are constantly red-hot when in use, and aside from the dangers arising from their permeability to poisonous gases, the burnt air is unfit for respiration. The correctness of this view must be apparent to every person of discrimination, and therefore it needs no argument to enforce it.

A moisture-laden atmosphere is abnormal and productive of evils, not only to human beings, but to furniture, books, and household ornaments. It will be found that children are frequently ill in families where heat is furnished from air flowing over iron surfaces heated to redness, and where, in consequence, water must be boiled to render life endurable. It is better to look to suitable apparatus for warming, than to attempt to avert evils by any unnatural processes, whereby steam is forced into our dwellings in unmeasured quantities.

THE AGES OF DARKNESS.

The ignorance which prevailed during the Middle Ages respecting the geography of the earth is surprising. The true orthodox system for more than ten centuries taught that the earth is a quadrangular plane extending four hundred days' journey east and west, and exactly half as much north and south; that it is inclosed by mountains on which the sky rests; that one of these mountains on the north side, higher than the others, by intercepting the rays of the sun produces night; and that the plane of the earth is not set exactly horizontally, but with a little inclination from the north; hence the Euphrates, Tigris, and other rivers running southward are rapid; but the Nile, having to *run up hill*, has necessarily a very slow current. It is important to state, however, that such vagaries were not believed by every one. There were, even in those dark times, a few superior minds that rose above the ignorance, superstition, and ecclesiastical dogmatism of the age, and groped their way into a less murky light. But gross ignorance enshrouded the minds of the masses, and a horrible intellectual darkness prevailed which was deeper than the pall of night. Advancing science has fortunately brought to us a better knowledge of nature.

MANAGEMENT OF STEAM APPARATUS.

The use of low-pressure steam apparatus for warming is quite extensive among house owners and directors of public institutions, and therefore it is important that a few facts connected with the management of such apparatus should be clearly understood. In the use of these devices, if insufficient warmth is experienced in any of the rooms of a dwelling, it will not remedy the evil to increase the fires, and carry steam pressure up a few degrees higher. It is not designed that low-pressure steam apparatus should be run under more than five or ten pounds' pressure, and increasing it within this range does not perceptibly add to the heat radiated. If rooms are not sufficiently heated in cold weather, the remedy is to increase the radiating surfaces. In every instance more radiators should be used than are needed in mild weather, so that a power in reserve may be held until it is wanted.

In radiators much comfort is often sacrificed to appearance. They are often painted in light colors, or bronzed or gilded, to please the eye, and thereby the radiating power is greatly diminished. We have often directed a bronzed radiator, against which complaint was made that it did not warm sufficiently, to be painted black, with coarse paint, and immediately the difficulty was removed. Light, smooth surfaces do not

diffuse or send off heat with facility, and they cannot be economically used.

Another trouble connected with the use of steam arises from ignorance of the fact that in mild weather it is unsafe to close all the radiators, with the view to quench the furnace fires and diminish the heat. In this way the steam is forced to accumulate until it finds vent at the safety-valve, and a volume is poured out into the basement or cellar which frightens the inmates of the dwelling, and injures everything with which it comes in contact.

Steam is not well adapted for warming our wooden houses in the Northern States. The cold is often so intense that by the slightest oversight the pipes and stopcocks become frozen in the night, and through the expansive power of frost they burst open, and great mischief is done. The walls of our houses are thin, and often the temperature in the vicinity of steam-pipes is much below the freezing-point, and hence there is great danger.

THE COMMON HAMMER.

The hammer seems a simple instrument enough, but Mr. J. Richards, in a book on mechanical topics, lately published in England, finds in it much that is curious and interesting, as the following extract will show: —

Few people in witnessing the use of a hammer, or in using one themselves, ever think of it as an engine giving out tons of force, concentrating and applying power by functions which, if performed by other mechanism, would involve trains of gearing, levers, or screws; and that such mechanism, if employed instead of hammers, must lack that important function of applying force in any direction that the will may direct.

A simple hand-hammer is, in the abstract, one of the most intricate of mechanical agents; that is, its action is more difficult to analyze than that of many complex machines involving trains of mechanism; but our familiarity with hammers makes us overlook this fact, and the hammer has even been denied a place among those mechanical contrivances to which there has been applied the mistaken name of mechanical powers.

Let the reader compare a hammer with a wheel and axle, inclined plane, screw, or lever, as an agent for concentrating and applying power, noting the principles of its action first, and then considering its universal use, and he will conclude that if there is a mechanical device that comprehends distinct principles, that device is the common hammer; it seems, indeed, to be one of those things provided to meet a human necessity, and without which mechanical industry could not be carried on. In the manipulation of nearly every kind of material, the hammer is continually necessary in order to exert a force beyond what the hands command, unaided by mechanism to multiply their force. A carpenter in driving a spike requires a force of from one to two tons; a blacksmith requires a force of from five pounds to five tons to meet the requirements of his work; a stone-mason applies a force of from one hundred to one thousand pounds in driving the edge of his tools: chipping, calking, in fact nearly all mechanical operations, consist more or less in blows, and blows are but the application of an accumulated force expended throughout a limited distance.

Considered as a mechanical agent, the hammer concentrates the power of the arms and applies it in a manner that meets the requirements of the work. If great force is needed, a long swing and slow blows accomplish tons; if but little force is required, a short swing and rapid blows will serve, the degree of force being not only continually at control, but the direction at which it is applied also. Other mechanism, if used instead of hammers to perform the same duty, would from its nature require to be a complicated machine, and act but in one direction or in one plane.

EDITORIAL NOTES.

Oriental Progress. — In our last number we referred to some of the evidences of progress in Turkey. If *Galignani* is to be believed, the Sultan has taken another advance step in engaging Dr. Mary Walker and two of her pupils to attend to the health of his harem. "Some curiosity," says our Parisian contemporary, "was caused on the boulevards on Friday by the appearance of three women attired in a singular costume, namely, large Zouave trousers, closed by gaiters, small gray paletots trimmed with black, and tall felt hats. On inquiry they were found to be Miss Walker, an American medical practitioner, and two of her pupils, who were stopping at the Grand Hotel. The lady is about fifty years of age, and the apostle of the emancipation of women in the United States, and belongs to the sect of the Bloomerists. She is said to be on her way to Turkey, where she has just accepted the post of private physician of the Sultan's seraglio."

A Venerable Physician. — In a note on the metallic nature of hydrogen, in the Journal for December last, we referred to a communication on the subject (received some time previous, but mislaid meanwhile) by Dr. P. Wroth, of Baltimore, not "*S.* Wroth," as the types accidentally made it. The doctor, by the way, is one of the most venerable members of the profession in the country, having practised medicine from 1807 to 1857. For some time he was professor of chemistry in Washington College, Chestertown, Md. It is rare that a physician after half a century of active service can look back upon eighteen years of the rest from labor honorably earned by so long a professional career. It is evident from his letters that Dr. Wroth is still in the full possession of his faculties, and that he keeps closer watch of the progress of science than many younger men.

Milk for Babes. — The Journal has no regular "juvenile department," though in the pages devoted to familiar science it aims to entertain and instruct both young and old. Not all science, however, is susceptible of this familiar treatment: and we doubt whether little boys just beginning chemistry would be specially interested to know that orthoamidotoluenesulphonic acid and diazorthoamidoparatoluenesulphonic acid are among the acids recently examined by M. Hayduck; or that the action of tin and hydrochloric acid on nitrobromacetaniline gives rise to the hydrochloride of ethenylbromophenylenediamine. We are by no means certain that even among an older class of readers we could awaken any marked enthusiasm with regard to the properties or reactions of metanitroiodobenzene, or bromodinitrophenol, or dinitrochlorophenol, or nitrotribromobenzene, which are among the compounds discussed in "a long and valuable paper by W. Koerner," as one of our foreign exchanges calls it. We sometimes have to use technical names that are polysyllabic and puzzling to non-scientific readers, but we do not venture on such monstrosities of chemical nomenclature as these.

Religion and Science. — In a recent address to workingmen in Glasgow, the Earl of Shaftesbury made some forcible and sensible remarks on this subject. The Bible, he said, has suffered far more from its friends than from its enemies. In their timidity they have deprecated inquiry, and so have appeared to distrust their own Zion. In their overzeal, as if the Bible could not take care of itself, they have proceeded to give explanations and interpretations which the language of Scripture would never justify, and then some clever scientific man has laid hold of it, and has overthrown the faith of many by his just criticisms and well-directed ridicule. Had he the wealth of Glasgow he would say to Max Müller and his Orientalists, "Here is the sum of £50,000; collect the facts you require. Send abroad your men. You say languages are dying out; send abroad and take the dying speech, the last confession, of these dying tongues." He would send the same sum to Professor Tyndall and say to him, "Accumulate your facts; I don't care about your theories, but turn your powerful intellect to the pursuit of facts." He firmly believed that if Glasgow or any wealthy city were to furnish such a means of advancing science, they would see that in less than ten years that grand old book would be like the ark upon the top of Mount Ararat, surveying the subsiding of the waters and rejoicing in the restoration of life and joy.

Expiration of an Ancient Lease. — It is safe to assert that a lease for 999 years has never run out in this country, but this has recently occurred in England. An estate let for that term has reverted to the original holders, or rather their representatives. The land is at Woolwich, and was church property a thousand years ago, but was leased to the crown for military purposes. "Few incidents," as an English exchange remarks, "could speak more eloquently of the stability of English institutions, and the law-abiding nature of Englishmen and their respect for the rights of property, than that there should be an unbroken continuity of possession from the time of Alfred the Great to that of Queen Victoria."

A New Use for Chloral. — According to the *Gazette Médicale de Bordeaux*, an eminent veterinary surgeon has informed the Medical and Surgical Society of that city that the coachmen of certain families had been for some time in the habit of administering chloral to the horses in their charge, so as to make them easier to ride or drive. It appears that the drug acted like a charm, for horses which had previously been so spirited as to give much trouble to their drivers became as quiet as lambs after a few days of this hyposthenic treatment. The great change naturally attracted the attention of the owners of the animals, and they sent for the veterinary surgeon to ascertain the cause of this sudden gentleness. That functionary noticed a certain tendency to sleep in the animals, but scarcely knew to what to refer this unusual condition, when in one of his visits he chanced to find a bottle half full of chloral. Here, then, was the *corpus delicti*, and the coachman, after much hesitation, owned that, following the advice of a brother whip, he gave his horses a dose of chloral every morning to make them go quietly, and he said that many of the fraternity in Bordeaux followed the same plan.

ATOMS.

Large tracts of land in the southern part of France, which have not hitherto repaid cultivation, are now being planted with the kind of oak-trees beneath which truffles are generally found, and it is expected that each acre of this land, which has of late been sold for as little as $25, will yield a crop of truffles worth $100 every year. — Speaking of dyspepsia, "the demon of America," an exchange well says, "Making haste to get rich, America has neglected her stomach; she has forgotten to learn how to enjoy her riches, and her generations of sallow, nervous, unstrung men and women will not be reconstructed in the sturdiness of their forefathers until men and women reach a point where they can take time to dine." — It is said that a rifle bullet cannot penetrate thirty sheets of paper. — Fourteen female medical students have just completed their

three years' course of study under the direction of the Women's Committee of St. Petersburgh. — A Chinese cure for ague, related by Dr. John Dudgeon in the Report of the Peking Hospital for 1873, is the following: Take a pitch-plaster, place a Spanish fly in the centre, either whole or reduced to powder, and apply it between the eyebrows or on the nape of the neck. — The school committee of Cambridge, Mass., subscribe for a sufficient number of copies of the *Nursery* to put the bright little magazine into every primary school in the city; and the same thing is done in many other places in New England. — A work on "Greek Roots" was lately called for by a gardener in one of our public libraries. — China is rapidly becoming Europeanized; a recent traveller tells of boat-loads of Bryant and May's safety matches going by canal to Peking, where, as well as at Canton, he says, every respectable tailor uses the sewing machine. — "Of all kinds of dogmatism," says Virchow, "the materialistic is the most dangerous, because it denies its own dogmatism, and appears in the garb of science; because it professes to rest on fact, when it is but speculation; and because it attempts to annex territories to the domain of natural science before they have been fairly conquered." — A large monumental fountain, ornamented by the celebrated sculptor Carpeaux, has been erected on the Observatory Place at Paris, representing Europe, Asia, Africa, and America, rotating the globe which they carry on their heads; but in spite of M. Le Verrier's protestations, they are making the globe turn from east to west, or just the reverse of its real motion. — "Argus with his hundred eyes," as Dr. Lyon Playfair remarks, "was not nearly such a practical man as the Cyclops with one eye; the hundred eyes of Argus were found napping when work had to be performed, but with the one eye of the Cyclops the trident was forged which assured to Neptune the empire of the sea." — The New Zealand government has sent special agents to England for the purpose of collecting a quantity of small birds of various kinds, and a colony of humble-bees, for introduction into that country; and another attempt will also be made this year to send salmon to the antipodes, only 135 fish being now alive out of the 120,000 salmon eggs sent two years ago. — Mr. Alexander Agassiz is on a tour in South America, partly for the sake of his health, and partly to investigate the natural history of Lake Titicaca, and to collect antiquities for the Peabody Ethnological Museum. — As the frequent "re-counts" of votes in disputed elections in this country appear to show that the counting is never done accurately, it would be well to adopt the new electrical contrivance invented in France, by which the votes are registered and their total reckoned up automatically. — A land owner at New Iberia, La., offers to give to each *bona-fide* settler fifty acres of land situated in a healthy, convenient place, about one and a half miles from constant navigation and a parish town (land very fertile, gently rolling, and good for corn, rice, cane, or cotton), on the simple condition that the man be married, of another State, white, and that he ditch the place around and build thereon a house as good as a "Carre cabin," costing one hundred dollars, and live on and cultivate the place.

SAFE FOR SALE. — Messrs. Billings, Clapp, & Co. offer for sale a Morris and Ireland Safe, with double doors both inside and outside, combination lock on outer doors, and good inside lock also. It is 5 feet high, 45 inches broad, and 35 inches deep, and is on iron wheels. It was made to order for Messrs. Billings, Clapp, & Co., but they have no use for it in their new office, a fire-proof vault being a part of the building. This is an excellent opportunity to purchase a first-class safe on very favorable terms, which may be learned on application at the office.

THE NEW SCRIPTURES.

According to Tyndall, Huxley, Spencer, and Darwin.

(Genesis, Chapter II.)

1. PRIMARILY the Unknowable moved upon cosmos and evolved protoplasm.

2. And protoplasm was inorganic and undifferentiated, containing all things in potential energy; and a spirit of evolution moved upon the fluid mass.

3. And the Unknowable said, Let atoms attract; and their contact begat light, heat, and electricity.

4. And the Unconditioned differentiated the atoms, each after its kind; and their combinations begat rock, air, and water.

5. And there went out a spirit of evolution from the Unconditioned, and, working in protoplasm by accretion and absorption, produced the organic cell.

6. And cell, by nutrition, evolved primodial germ, and germ developed protogene, and protogene begat eozoön, and eozoön begat monad, and monad begat animalcule.

7. And animalcule begat ephemera; then began creeping things to multiply on the face of the earth.

8. And earthy atom in vegetable protoplasm begat the molecule, and thence came all grass and every herb in the earth.

9 And animalcula in the water evolved fins, tails, claws, and scales; and in the air, wings and beaks; and on the land they sprouted such organs as were necessary as played upon by the environment.

10. And by accretion and absorption came the radiata and mollusca, and mollusca begat articulata, and articulata begat vertebrata.

11. Now these are the generations of the higher vertebrata, in the cosmic period that the Unknowable evoluted the bipedal mammalia,

12. And every man of the earth, while he was yet a monkey, and the horse, while he was a hipparion, and the hipparion, before he was an oredon.

13. Out of the ascidian came the amphibian and begat the pentadactyle, and the pentadactyle by inheritance and selection produced the hylobate, from which are the simiadæ in all their tribes.

14. And out of the simiadæ the lemur prevailed above his fellows and produced the platyrrhine monkey.

15. And the platyrrhine begat the catarrhine, and the catarrhine monkey begat the anthropoid ape, and the ape begat the longimanous ourang, and the ourang begat the chimpanzee, and the chimpanzee evoluted the what-is-it.

16. And the what-is-it went into the land of Nod and took him a wife of the longimanous gibbons.

17. And in process of the cosmic period were born unto them and their children the anthropomorphic primordial types.

18. The homunculus, the prognathus, the troglodyte, the autochthon, the terragen — these are the generations of primeval man.

19. And primeval man was naked and not ashamed, but lived in quadrumanous innocence, and struggled mightily to harmonize with the environment.

20. And by inheritance and natural selection did he progress from the stable and homogeneous to the complex and heterogeneous; for the weakest died, and the strongest grew and multiplied.

21. And man grew a thumb, for that he had need of it, and developed capacities for prey.

22. For, behold, the swiftest men caught the most animals, and the swiftest animals got away from the most men; wherefore the slow animals were eaten, and the slow men starved to death.

23. And as types were differentiated, the weaker types continually disappeared.

24. And the earth was filled with violence; for man strove with man, and tribe with tribe, whereby they killed off the weak and foolish, and secured the survival of the fittest.

QUESTIONS AND ANSWERS.

L. S. T., NEWBURYPORT, MASS. The reason why wax candles do not require snuffing is that the wick is twisted in a peculiar way, so that it bends out into the ignited gas when lighted, and thus is constantly burned away as the wax consumes. This device regarding the wick is a small matter, but one really of great importance, as it does away with snuffers entirely.

C S., NORTHAMPTON, MASS. To light the gas-jet by the electrical spark, it is only necessary to select a clear, cold day or night, and, with slippers on feet, scuffle across the carpet of the room two or three times and then quickly apply the knuckle to the escaping gas. It is best to have an assistant, so that at the instant the knuckle is applied a quarter of an inch above the gas tip, the gas may be turned on in very small volume. Do not open the jet full, but turn on a slowly escaping current of gas. With a little experience and patience you will succeed. It is an interesting experiment.

H. S. R., DRUGGIST, MILWAUKEE, WIS. To test cinchoquinine, take say 100 grains of the substance, dissolve in dilute acid, precipitate with ammonia in excess, then shake up precipitate with excess of ether, decant, and filter the ether. The ether holds the quinine in solution. To prove its presence, add chlorine water and ammonia (green coloration); or add ferrocyanide of potassium, chlorine water, and ammonia (purple coloration). Evaporate some of the ethereal solution to dryness, and then by the use of the microscope apply Stoddart's test. Observe whether the solution of the ethereal extract in dilute acid gives any fluorescence. The ammonia used in these reactions should be very dilute. These tests *skilfully* applied will prove abundance of quinine to be present in every phial of genuine cincho-quinine ever prepared.

H. G., SUFFERN, N. Y. The green color produced by mixing an alcoholic solution of guaiacum resin with milk is due to oxidation. Most oxidizing agents, and even atmospheric air, will cause the change in color, especially under the influence of organic substances.

J. R., REPUBLICAN. Our correspondent dates his letter of inquiry from "Republican" — no State given. If he had given the name of the State, a reply would have been sent by mail, as a stamp was inclosed. Your plan of extinguishing fires by conveying carbonic acid gas through cities in pipes is not new. There are many practical difficulties in the way of conveying the gas, as it would be likely to occasion great loss from leakage. Carbonic acid gas is not so readily retained under pressure as carburetted hydrogen, or illuminating gas. Perhaps a solution of the gas in water might be used in the way you suggest, but the expense of constructing and maintaining the apparatus would be great.

L. N. P., ASHLY, OHIO. A solution of sal-ammoniac in water will often give relief in troublesome chilblains.

B. R., PHILADELPHIA, PA. The water of rivers is purified to a remarkable extent by motion. We have several times made analysis of the waters of Merrimack River below Lawrence, Lowell, and the other large manufacturing towns on the river, and found them to be of extraordinary purity. The enormous quantities of filth washed into the stream could not be detected six miles below Lawrence, by chemical tests. As regards the question whether we should be willing to employ the water for culinary purposes, we answer, No. If for no other reason, the associations connected with it would deter us from its use.

A SUBSCRIBER, CLINTON, N. Y. You do not fully realize the great difference in the nutritive value of different kinds of hay. Hay of the same variety of grasses grown on different fields will vary widely in its nutritive value. In some trials made at the farm, it has been found that the herd of cows fed on upland hay, grown on a certain plot of land, fell off one quart each in yield of milk, in twelve hours. When changed to hay of nearly the same varieties grown on another field, the full quantity was restored, in about the same number of hours. Land capable of growing heavy crops does not produce grass of such value as that not in so high tilth.

B. N. T., MANCHESTER, N. H. Oyster shells and gas works' lime are not worthy your attention as fertilizing materials. They contain no important agents capable of plant assimilation. In some cases they do harm to fields to which they are applied.

O. H. R., ENFIELD, N. H. Bleached shellac and bleached linseed-oil can be procured of paint dealers in any large city.

J. S., VANDALIA, ILL. "How can I make liquid slating which may be used upon writing-paper?" We have found the following article to answer well for this purpose: First, take three parts of the finest ground pumice-stone, and one part of lamp-black; add a little alcohol and grind thoroughly until the mixture appears of a uniform black color. Then dissolve one part of shellac in four parts of alcohol, and stir in the pumice-stone and lamp-black. This liquid makes a surface that can be used with either slate pencils or chalk. It should be kept well stoppered when not in use. If too thick, add a little alcohol. Stir well before using. It will be ready for use half an hour after application.

M. H. P., PHILADELPHIA. A friend who has been troubled in the same way by the gumming and sticking of the coarse bristle brush generally used for mucilage says that by accident he substituted an ordinary camel's-hair pencil, and has since had no trouble from the brush's drying and stiffening. He thinks that it would be well to furnish such a brush with mucilage bottles instead of the common one.

We have lately seen in shop windows a new form of mucilage brush, consisting simply of a rectangular piece of india-rubber with a wooden handle. The idea strikes us as a good one, though we have not tested it.

C. S. M., BROOKLYN, N. Y. In the best hydraulic rams about 60 per cent. of the force is utilized, but the average result is probably not above 50 per cent. The force is the product of the amount of water from the source multiplied by the height through which it falls before acting on the machine; the useful effect is the product of the quantity of water raised to the cistern multiplied by the height to which it is raised. Montgolfier, the inventor of the machine, states that with a fall of 7½ feet and a flow of 315 litres, a ram in his garden raised 30 litres to a height of 50 feet. In that case, about 64 per cent. of the force was utilized: $315 \times 7\ 5 = 2362.5 =$ force; $30 \times 50 = 1500 =$ useful effect; $1500 \div 2362.5 = .64$ nearly. It is not safe, however, to count upon so favorable a result in the long run.

J. O., CAMBRIDGE, MASS. "The New Scriptures," which we reprint above, first appeared in the *Cincinnati Commercial*. It is one of the best scientific *jeux d'esprit* we have ever seen, and we can imagine the grave face of Darwin himself "evoluting" a broad grin if it should fall under his eye.

LITERARY NOTES.

HE who collects into a compact manual information that was before to be found only by searching through many volumes is to be reckoned a public benefactor. This is what Professor Prescott has done in his *Outlines of Proximate Organic Analysis*,

just published by Van Nostrand. It is a most valuable compilation for laboratory use. The work has been well and thoroughly performed, and the results of the most recent research are incorporated in the book.

Chemical and Geological Essays, by Dr. T. Sterry Hunt, published by J. R. Osgood & Co., includes some twenty papers selected from the author's contributions to scientific journals. The *North American Review* for January, in a highly commendatory notice of the book, remarks that "it would not be amiss to call it an encyclopædia of chemical geology," and that "on the whole, the volume is among the most creditable monuments of American science."

Among the other recent publications of the same house are Howells's *A Foregone Conclusion*, which all the critics concur in eulogizing as a singularly perfect production, unrivalled among American works of fiction; Bret Harte's *Echoes of the Foot-Hills*, a collection of his later poems, among which are some of his best; and *The Circassian Boy*, a poem translated from the Russian of Lermontoff by S. S. Conant, which one of our leading poets compares to Byron's "Mazeppa."

All classical scholars will thank Professor F. A. March for the *Latin Hymns*, collected and annotated by him as the first volume of the "Douglass Series of Christian Greek and Latin Authors," and published in excellent style by the Harpers. It includes all the gems of Latin hymnology from Hilary, of the fourth century, down to Gladstone, of the nineteenth. The notes show not only thorough scholarship but refined poetical taste. The illustrations from English poetry are admirable.

We are glad that "Harper's Language Series," edited by Professor Swinton, is appreciated by educators, and is rapidly displacing the wretched books on English grammar and composition that have disgraced our schools. The series includes four little books, and their small size is one of their best features. Even the *Progressive Grammar*, intended for "use in the higher grades in grammar schools and in high schools," contains only two hundred duodecimo pages, but we have seen no other book of the kind that is half so good.

The second (January) number of the *Official Postal Guide* has been issued by Hurd and Houghton. No one who has an extended correspondence can know how helpful in many ways this manual is, until he has tried it. After trying it, he would not dispense with it if it cost tenfold what it does.

The Boston Medical and Surgical Journal begins its *ninety-second* volume with Hurd and Houghton for its publishers, and in a handsome new dress. The opening numbers show also that it is to be improved internally as well as externally, so that it will be still more worthy of the support of the profession.

Medicine and Pharmacy.

SLOW TO LEARN.

Of all teachable animals man is unquestionably the slowest to learn whatever pertains to his personal well-being. Most other creatures are quick to avoid anything that they have found to injure them. A dog of average canine intelligence is not easily made the victim of the same trick twice. Foxes and many other animals suspect and shun the traps that are cunningly set to catch them. But man, though often warned of the danger ahead, runs stupidly into it again and again. Inventive genius is often baffled in the attempt to keep him from misusing the very devices that are intended for his safety. It is a familiar fact that English miners will persist in opening their Davy lamps to light their pipes, at the risk of having their pipes put out forever, and more than one contrivance has been patented to render this foolhardiness impossible. In our own country, neither law nor logic can keep people from self-cremation with "non-explosive" burning fluids.

In the high places of science and enlightened culture we might confidently look for the practical wisdom that we fail to find among the common herd of mortals, but we are doomed to disappointment. The recent death of Mr. Warren, of the British Museum, is lamented as a public misfortune, but there is no doubt that his disease was aggravated, if not induced, by having to work in a damp and unventilated room. When his health began to fail, he consulted a leading London physician, who asked to see the room in which his patient spent the larger part of his time. It is hardly credible, but it is stated on good authority that when Mr. Warren reported to the chief officer of the museum the doctor's opinion that his room was unfit for occupation, he was reprimanded for introducing a medical man without the express leave of the said officer. And these things happened in the very Parthenon of English science and art, the most sacred shrine of the nineteenth-century Minerva!

We read also in the *Times* that in the room in the Guildhall where Justice Grove (renowned as the author of the modern scientific doctrine of the correlation of forces) holds his court, the gas-burners have to be kept lighted on cold days for the sake of the warmth, though at the expense of the purity of the air, the room being unventilated. A juror suggested one day that the gas should be put out; but the judge replied, "The other day when it was not alight I was seized with a shivering fit. We are in this predicament: we must either be frozen or stifled with carbonic acid gas; but we are accustomed to that in the city." The temple of justice in the metropolis of the civilized world, like the temple of wisdom, appears to be a mere "Black Hole of Calcutta," where the ermined judge is poisoned by pestilential air worse than that of any well-built prison.

If "our poor relations," the lower animals, could know of these things, would they not echo the exclamation of Puck, "Lord! what fools these mortals be!"

SPONTANEOUS COMBUSTION OF THE HUMAN BODY.

Writing on this subject in 1869 we expressed the opinion that the belief in the spontaneous combustibility of the human body is a "vulgar superstition," although it has occasionally had the support of a scientific man. Liebig, who in 1851 carefully investigated all the forty-five cases alleged to have occurred up to that time, came to the conclusion that not one of them was clearly proven; and on scientific grounds he pronounced the spontaneous combustion of the living body absolutely impossible. We see by foreign journals that the subject has again been examined by M. Chassagniol, of Brest, who has reported the results to the Paris Société de Chirurgie. After trying to sift the truth from the conflicting accounts on record, he has decided, as Liebig did, that no case of the kind has been fairly substantiated. No medical man, no trustworthy witness, has ever been present at a case of spontaneous combustion of the human body. Many authors have affirmed that the body burned on these occasions with a blue flame, and diffused an empyreumatic smell, but these characteristics are met with in many kinds of combustion. Instances have been sought for in alcohol drinkers, especially among women, but hitherto without success. The original idea was that the alcohol in drinkers took fire. Dead bodies, or portions of dead bodies, however, burn but very slowly, even after having been steeped in alcohol for some days. After having injected alcohol into the veins of dogs, the air from their lungs could not be set on fire. Electricity has also been suggested as a possible cause of spontaneous combustion; while others have ascribed it to the presence in the body of some highly inflammable gas. Repeated analyses, however, have failed to show the presence of phosphides of hydrogen in any part of the human body. Some have believed that a resemblance could be found between the spontaneous combustion of stacks of hay and straw, and that of the human body; but there is really no analogy between them. M. Chassagniol is, therefore, necessarily brought to the conclusion that the fact of spontaneous combustion is not made out.

CAMPHOR WATER.

The simple camphor water, *aqua camphora*, of the shops is one of the best and cheapest washes for the teeth and mouth. Its detersive power is great, leaving the mouth and gums very clean and sweet. It is fatal to parasites, and therefore discouraging to tartar and decay. It has also a healing influence upon aphthous sores (canker) of the mouth and throat. It lessens sensibility of the teeth, and tends to resolve the small abscesses known as gum-boils. We recommend it as a standard article of the toilet.

There are some sore throats, and we are not sure but that they include those of a bad type, which appear to be speedily relieved by gargling with camphor water in the incipient stage. The antiseptic property of camphor, or power to destroy minute organisms, gives it value in many applications to the skin and mucous membrane.

Spirits of camphor is one of the most common domestic remedies. It is singular that camphor water, one of the most elegant modern preparations of the materia medica, should be still so little popularly known and used. C.

DOMESTIC REMEDY FOR NIGHTMARE.

Slight derangement of the digestive or other functions is often sufficient to occasion a temporary delirium in children, commencing during sleep and prolonged after waking. The suffering is great and the condition an alarming one to parents and friends. The mental excitement is so intense as to resist impressions from without, to an extraordinary degree. It is here that the associations of smell can be used more effectively than any others to break up the morbid train. A good whiff of cologne almost always brings the little sufferer back to its ordinary world; or a little ammonia may be used. But an odor which is agreeable is probably more effective than one which is merely pungent.

It is a common observation that mental associations are awakened by odors more than by the impressions of any other sense. In the case of nightmare the strong, familiar smell seems to break up the train of abnormal mental excitement.

It is not straying from the subject to ask if the associations of smell, such, for instance, as the odor of flowers, have ever been used tentatively in the treatment of the insane.

W. F. C.

AMATEUR NURSING.

This is the theme of a piquant article in a recent number of the *Saturday Review*. The following extracts explain so well "how *not* to do it," that they are indirectly very instructive:

Affection only, however warm, will not qualify a sick-nurse. The cool head and steady hand of a professional stranger is too often to be preferred. Many a life has been sacrificed by ignorance or stupidity or anxiety, where the nurse would gladly have died to save the patient. The event of a

fever has before now been determined by the clapping of a door, or by an injudicious spoonful of unsuitable food. The indulgence of some whim which a fond mother cannot deny to her sick child may prove fatal. The longed-for change of posture may be accorded a day too soon. The cruel application of another blister may be put off a day too long. A moment's thorough draught, a cup of tea, a piece of news, a second pillow, may settle the struggle between life and death. How often the doctor leaves a house feeling that it is only in spite of the nursing that his patient will recover! He shudders to think of the messes which will be brought up as beef-tea. He is in despair when a poultice is prescribed, as he is almost certain it will be so applied as to do more harm than good. And, valuable as all kinds of baths are in illness, he dare not order them, knowing the insane way in which his orders will be carried out. Above all, he is afraid of what may be termed the "cumulative dose," whether of medicine or nourishment; and finds it impossible to persuade either the patient or his family that half a dozen tablespoons of brandy in half a dozen hours are not the same thing as one glass in six hours; or that, where he orders medicine to be taken every two hours, the effect will not be the same if a double or treble dose is taken at once to save trouble. . . .

It is painful to see a patient nursed in the common manner. The tact required for a sick-room differs from all other kinds of experience. Amateur nurses seldom possess it. Now and then a lady is to the manner born, and without instruction or previous experience blossoms into a full-grown nurse at a moment's notice. The doctor who finds one ready in a house rejoices heartily. His own credit as well as the recovery of his patient is probably assured. Seldom, however, has he this good fortune. His ordinary experience is very different. If he wishes the sick-room kept at a certain temperature, he cannot have it managed. The fire is alternately half extinct and blazing up the chimney. There is no care to have it warm at sunrise and sunset, and moderate when the sun is shining and the air warm. The invalid is awakened from a priceless sleep by hearing the cinders fall on the unprotected fender, or by the noise of a clumsy hand putting on coals, which might easily have been wrapped in pieces of damp paper and left ready for noiseless use. The morning meal is perhaps delayed until the patient has passed from appetite to faintness. Perhaps, when it comes, the tea is smoked. Household troubles are freely discussed in the room. Mary has given warning because there is so much more going up and down stairs since missus was ill; the cook is so extravagant, and yesterday's dinner was spoilt; Johnny has cut his finger, and Lucy has tumbled down-stairs; such things are told as if they would amuse the invalid. But worse than this is the mysterious whispering at the door, and the secrets obviously kept to excite the nervous patient's suspicions. The irritating creak of a dry boot, the shuffling of a loose slipper, try a sick person's patience unreasonably; and the amateur nurse argues against such silly fancies, and thinks they are matters in which reasoning can be of any avail. The untrained nurse never commences her arrangements for the night until the patient is just beginning to grow a little sleepy. She then arranges the pillows, moves the chairs, stirs the fire, and perhaps makes up her own bed. Such fusses at sleeping-time produce fever in a most unaccountable way, and the amateur is amazed and bewildered because the patient lies awake all night. Besides all this, and no matter how noisy and elaborate the preparations for the night's campaign, several things are forgotten down-stairs; no beef-tea is to be had in the middle of the night, no spoon for the medicine, no boiling water. Amateurs do not know that sick people should not be asked what they will have, but should be saved even the mental exertion of making a choice. However desirable it may be that they should arrange their affairs, business matters should not be discussed before them. Sometimes a man who has not made his will before his illness is anxious and uneasy till he has made it, and gets better when the matter is off his mind. But to arrange such things requires nicety and tact such as the amateur, who perhaps shares the sick man's anxiety, cannot show.

HYDRATE OF CHLORAL AS A SOLVENT.

Mr. Robert F. Fairthorne writes to the *Journal of Pharmacy* as follows: —

A solution consisting of pine parts of hydrate of chloral and three of water, I find capable of dissolving the following substances, to the extent named: —

One grain of morphia is dissolved by a portion of the liquid containing twelve grains of the hydrate, one grain of veratria by a portion containing five grains, and one grain of atropia by a portion containing twenty grains.

These active principles should be in powder, mixed with the solvent in test-tubes, and heated by means of a water-bath, with occasional agitation.

The solutions thus made are in a convenient form for employment, either alone or when mixed with oils, ointment, or glycerine. Camphor, too, is freely dissolved by them, and in some cases can be added to them with advantage.

Glycerine I find to be a convenient agent for forming solutions with chloral and the above-named substances, and the following will be found, when properly combined, to produce permanent and elegant preparations, namely: —

Chloral Glycerite of Morphia.

Morphia (powd.)	gr. v.	
Chloral hydrate	ʒj	
Glycerine	fl. ʒss.	M

Chloral Glycerite of Veratria.

Veratria	gr. v	
Chloral hydrate	ʒj.	
Glycerine	fl. ʒss.	M.

Ointment of Chloral and Veratria.

(Corresponding in strength to the Ung. Veratriæ, U. S. P.)

Veratria	gr. x.	
Chloral hydrate	ʒj	
Water	6 drops.	
Lard ointment	ʒss.	M.

Chloral Glycerite of Morphia and Camphor.

Morphia	gr. v.	
Chloral Camphor	āā ʒj.	
Glycerine	fl ʒss.	M.

Lotion of Chloral and Iodine.

Iodine	gr. xx.	
Iodide of potassium	gr. vi.	
Glycerine	fl. ʒj.	
Chloral hydrate	ʒij.	M.

Chloral can also be combined with collodion, in which it dissolves after the addition of a few drops of alcohol.

NEURALGIA.

As increased attention has recently been called to this distressing and often fatal disease, a few words upon the subject may not prove unacceptable to the readers of the Journal.

I am daily strengthened in the conviction that this disease is asthenic in character, although the sufferer may not necessarily be of a cachectic diathesis. Decay and partial loss of the teeth, with consequent difficulty in mastication, and, as a result, imperfect digestion, are among the chief causes which produce a lack of vital force, diminishing nerve nutrition, and inducing the condition known to the profession as a neuralgic diathesis. In practice I daily meet with persons suffering from neuralgia, who, upon coming under prompt and vigorous tonic treatment, are speedily restored to a normal condition, the pains vanishing as the digestive organs resume tone and strength. For several years I have used the elixir phos. ferri, quin., et strych., which has never failed to produce the desired tonic result.

I now rely upon the croton chloral to give the patient relief from all neuralgic pains until the general system can be recuperated, and brought into a condition to defy this wearing, exhausting disease. The physician in dealing with it varies his treatment to meet the requirements of different constitutions.

J. H. Johnson, M. D.

Providence, R. I., *January* 9, 1875.

MEDICAL MEMORANDA.

Drunkards and Dipsomaniacs. — The *London Medical Record* quotes from Dr. Magnan (who has lately published a work on "Alcoholism") a statement of the distinction between alcoholism, or drunkenness, and dipsomania. Dipsomania he states to be a form of instinctive monomania; whilst alcoholism is a poisoning. He quotes Trélat, who says that "drunkards are men who get drunk when they get the chance of drinking. Dipsomaniacs are people suffering from disease, who get drunk whenever they get an attack of their peculiar disorder."

An English Critic on Chicago Pharmacal Style. — The London *Chemist and Druggist* remarks, in its last number, "We often read the communications of our American brethren with a certain amount of awe, for we fail in every case to grasp the English meaning of the newly-coined expressions. The opening passages of the *Chicago Pharmacist* of August are more than usually complex. Would some of our talented students try their hand at an explanation of this sentence? 'Pharmacal Items. The want of uniformity in the containers and labels of chemicals and pharmacals furnished by the manufacturer has appeared to the writer as a great impediment to the pharmacist in compounding prescriptions. For, if containers are furnished at all, why could not a more uniform style be adopted, which, if not benefiting them pecuniarily, would at least afford them the satisfaction that their goods are packed and labelled in a manner most convenient to be handled, and which will be sure to be appreciated.'"

Found out Three Centuries too Late. — The Paris correspondent of the *Pall Mall Gazette* says that Dr. Corlieu has just come to the conclusion that the eldest son of Francis I. died of acute pneumonia, brought on by drinking cold water when he was hot. And yet more than 300 years ago the unfortunate cup-bearer of the Dauphin was first put to the torture, and then drawn and quartered, for having poisoned the prince. The Dauphin had been playing at tennis at Lyons, and, being very hot, told Sebastian Montecuccoli to hand him a bowl of water, which he drank off; as he at once sickened and died, the cup-bearer was supposed, at the instigation of Charles V., to have administered poison. He was tortured, and of course confessed anything required of him, naming two of the emperor's generals as having been his accomplices. From the report of a committee of physicians who examined the body, Dr. Corlieu shows that the Dauphin perished through his own imprudence. He has thus vindicated the memory of Montecuccoli, though he is three centuries too late to save the poor fellow's life.

A New Death-Test. — A memoir has just been published by Dr. Ange-Monteverdi on a simple, easy, prompt, and certain method of distinguishing real from apparent death. The plan suggested consists in the subcutaneous injection of a small quantity of liquor ammoniæ, the strength of which should be considerable (sp. gr. 0.92). When injected into the living body, even during the last hours of life, ammonia causes the appearance of a spot of a

deep red or purple color, which forms more or less quickly according to the rapidity of the circulation. If the fluid be injected after death, no change in the color, or only a darkening of the natural color of the skin, is produced. If injected into a person in perfect health, a severe burning pain is experienced, and a small blister rises in the centre of the spot. No harm beyond the formation of a small eschar appears to result from the injection, and all traces vanish in the course of a fortnight. It seems to be a test which, being founded on a physiological basis, may be fairly trusted.

Chloral in Sea-Sickness. — According to *L'Union Médicale*, M. Giraldes, who has had very frequently to cross the Channel, and always has suffered from sea-sickness whenever the sea has been at all rough, states that some recent trials he has made of chloral have proved perfectly successful in preventing this horrid malady, even when the sea has been most tempestuous, and all his fellow-travellers have been suffering in consequence. He remains on deck sitting quietly, and on one occasion he slept the whole passage during a furious sea. The formula he has found most useful consists of chloral three grammes (forty-five grains), distilled water, currant syrup, of each sixty grammes, and two drops of essence of mint. Of this he took one half immediately on coming on board, and arrived at Dover without any suffering. On the return voyage he took the rest with like effect.

Another New Medicine from South America. — The London medical journals are discussing a new tonic medicine called *boldo*. The tree from which it is obtained is said to be found on isolated mountain regions in Chili. The bark, leaves, and blossoms possess a strong aromatic odor, resembling a mixture of turpentine and camphor; the leaves contain also a large quantity of essential oil. The alkaloid obtained from the plant is called *boldine*. It is valuable chiefly as a stimulant to digestion, and as having a marked action on the liver. This was discovered accidentally. Some sheep which were liver-diseased were confined in an inclosure which happened to have been recently hedged with boldo twigs. The animals ate the leaves and shoots, and were observed to recover speedily. Direct observations prove its action: thus, one gramme of the tincture excites appetite, increases the circulation and produces symptoms of circulatory excitement, and acts on the urine, which gives out the peculiar odor of boldo. The tree is probably, as *Nature* remarks, the *Boldoa fragrans*, the Chilian name of which, however, is usually written *Boldu*. "The leaves, which are rough, are opposite, ovate, and borne on short stalks. The plant is diœcious, and the flowers are borne in axillary racemes. All parts of the tree are fragrant; hence its specific name. The little berries are eaten, the bark is used for tanning, and the wood is considered by the natives superior to any other for making charcoal."

FOREIGN SANITARY MEMORANDA.

Food Adulteration in England. — The new laws with regard to food adulteration in England are leading to rather startling revelations in many quarters. At Bristol, the public analyst, in his last report to the City Council, stated that of eighty-nine samples of food received during the quarter, forty-seven were impure. Six samples of tea were badly adulterated with a large percentage of a counterfeit imitation composed of small pieces of quartz, sand, stalks, etc., and made into pellets with gum. In two instances this was colored and faced in order to imitate the appearance of green tea. These two samples contained nearly 10 per cent. of this rubbish and sand. The sample of sugar was impure from glucose and dirt, and had a strong, disagreeable smell. The twelve samples of milk were all extensively lowered, seven having from 15 to 70 per cent. of the cream abstracted, and four with from 20 to 30 per cent. of water added. One was very alkaline. The whiskey contained so much fusil oil that it was brought for analysis because it had produced unpleasant symptoms whenever the person drank any. Many samples of butter sold as "pure country" contained as much as 25 per cent. of foreign matter. All the samples of water examined were unwholesome, evidently from sewage contamination.

Scavengering in Paris. — The *Débats* gives an account of the scavengering of Paris, the efficiency of much of which might serve as hints to the authorities of some of our great cities. The superficial area of the public thoroughfares is eleven million metres, and to cleanse this before the traffic of the day begins, operations have to commence about three A. M. The staff employed musters in brigades at certain points of each quarter, and is then dispersed over the various streets. Beside them may be seen the nocturnal philosophers who pry into the filth and rubbish deposited near the curb. The two classes are on very friendly terms, the scavenger facilitating the *chiffonier's* search, and assisting him, if necessary, in getting a good harvest. In addition to sweeping by hand, more than forty machines are at work; the driver, who must keep an eye on his horse, manages from his seat a spring which raises or lowers the sweeping cylinder. These are principally used for the boulevards, avenues, squares, and wide streets, and are at work nearly all day. In bad weather they traverse the most frequented streets, and sweep away the mud or snow. Sweeping by hand is very active the whole morning in the vicinity of the chief markets, where masses of rubbish of all kinds abound. Between six and ten o'clock scavengers are there hard at work, and heaps of rubbish are carted away.

Simple Method of Preparing Ozone. — According to an Italian medical journal, chambers may be ozonized very easily by means of a mixture of the protoxide of manganese, or of the permanganate of potash, and oxalic acid. Two spoonfuls of this powder, moistened with twice the amount of water, and a trifle more of water every two hours, will emit ozone freely. It should be borne in mind that ozone oxidizes metals rapidly, except gold and silver.

Science and Longevity. — The obituary list read at the anniversary meeting of the Royal Society shows that science is favorable to longevity. The total number of deaths within the year, *i. e.*, from November 30, 1873, to November 30, 1874, was 14. Of these, three were under seventy; five were between seventy and eighty; five between eighty and ninety; and one, Sir G. Rose, was ninety-four. The present number of the society is 525, of whom Sir Edward Sabine is now the "father." He was elected a Fellow in 1818, and is the last of the men elected within the second decade of the century. Of Fellows elected within the period 1820–1829, eighteen remain, who now take rank as "veterans."

THE ORACULAR PHYSICIAN.

The doctor, who was a red-nosed gentleman, with a great bunch of seals dangling below a waistcoat of ribbed black satin, arrived with all speed, and taking his seat by the bedside of poor Nell, drew out his watch and felt her pulse. Then he looked at her tongue, then he felt her pulse again, and while he did so, he eyed the half-emptied wine-glass as if in profound abstraction.

"I should give her," said the doctor at length "a teaspoonful, every now and then, of hot brandy and water."

"Why, that 's exactly what we 've done, sir," said the delighted landlady.

"I should also," observed the doctor, who had passed the foot-bath on the stairs, "I should also," said the doctor, in the voice of an oracle, "put her feet in hot water, and wrap them up in flannel. I should likewise," said the doctor, with increased solemnity, "give her something light for supper — the wing of a roasted fowl now" —

"Why, goodness gracious me, sir, it 's cooking at the kitchen fire this instant!" cried the landlady. And so indeed it was, for the schoolmaster had ordered it to be put down, and it was getting on so well that the doctor might have smelt it if he had tried; perhaps he did.

"You may then," said the doctor, rising gravely, "give her a glass of hot mulled port wine, if she likes wine" —

"And a toast, sir?" suggested the landlady.

"Aye," said the doctor, in the tone of a man who makes a dignified concession. "And a toast — of bread, if you please, ma'am."

With which parting injunction, slowly and portentously delivered, the doctor departed, leaving the whole house in admiration of that wisdom which tallied so closely with their own. Everybody said he was a very shrewd doctor indeed, and knew perfectly what people's constitutions were; which there appears some reason to suppose he did. — *Old Curiosity Shop.*

SELECT FORMULÆ.

For Chilblains. — According to the *Revue Médico-Photographique* the following is a very convenient, economical, and efficacious application for chilblains and "chaps:" —

Alcohol (85°)	100 parts.
Glycerine	25 "
Carbolic acid	1 "

Professor Hebra of Vienna recommends the following ointment to be spread on strips of linen, and wrapped at night around the parts affected with chilblains: —

Cerat. simp.	
Olei. olivæ	ää fl 3 ij.
Glycerinæ	fl 3 ij.
Camphoræ tinct.	fl 3 j. M.

Fruit Syrups. — A correspondent of the *Druggists' Circular* gives the following formula for fruit syrups "that will not ferment:" —

Pure fruit juice	16 fl. ounces.
Diluted acetic acid	1 fl. ounce.
Water	7 fl. ounces.
Granulated sugar	3 pounds.

Mix, and agitate frequently for several days, until the sugar is dissolved, using no heat. Keep in air-tight vessel, and in a cool cellar.

To Remove Nitric Acid Stains. — According to *Reimann's Farber Zeitung*, these yellow stains, so familiar to the chemist and druggist, can be removed either from the skin or from brown or black woolen garments, by moistening the spots for a while with permanganate of potash, and rinsing with water. A brownish stain of manganese remains, which may be removed from the skin by washing with aqueous solution of sulphurous acid. If the spots are old they cannot be entirely removed.

SPECIAL NOTICE.

Notwithstanding the notice in the last issue, we are still receiving from distant sources Nos. 1 and 11 of Vol. VI. We have no use for them, and send back each copy on its arrival. Every copy of these numbers which has reached us up to the present time, has been returned excepting two which we retained and paid for, and about a dozen others which give no trace of the sender. We have forwarded with each paper a letter of apology, and inclosed postage stamps sufficient to pay the actual cost of mailing by the sender, thus saving him from loss. We cannot remunerate our friends for the trouble caused, but regret it for their sakes as well as our own.

Boston Journal of Chemistry.

VOLUME IX. BOSTON, MARCH, 1875. NUMBER 9.

Familiar Science.

FARMS UNDER THE SEA.

IT is an old maxim that what is worth having can only be acquired by hard labor. The low lands which have been formed east of the German Ocean from the silt and mud brought down from the interior by the rivers Rhine, Scheldt, and Meuse must have seemed worth having to the old forest men of the first centuries of the Christian era, or they would not have built their habitations in the unhealthy marshes, and entered upon a contest with winds and tides for their possession. As the result of this terrible contest, some of the worst land in Europe has been made its garden spot. Here in the *Netherlands*, or low lands, were bog and drifting sand, lake, pond, marsh, river, and ocean floods, and undoubtedly, when cultivation first commenced, all manner of reptiles and creeping things in its stagnant pools and muddy basins. How could it be possible to bring land into tilth which was absolutely lower than the ocean tides, and which was swept by the fiercest blasts from the seas? But it has been done, and now let us consider briefly *how*, or what methods have been resorted to for accomplishing such stupendous results.

Of course, in order to reclaim this land, the first work to be done was to get rid of the superabundance of water. "Water, water everywhere" prevailed, and when fresh supplies were not furnished by the overflow of the rivers, the great inflowing tides turned the whole delta into one vast lake. At the lowest stage of water in the earliest times in the history of Holland, there were no less than 150 lakes, most of them lower than the level of the sea, which have all been pumped dry, and the shallow basins are now covered with the most luxuriant vegetation. These lakes were drained long before a steam-engine was heard of; and long before London or Paris had in their neighborhoods a single garden for vegetables, the enterprising and thrifty Dutch sent to those cities cabbages, turnips, and other vegetables in great abundance.

When in Holland a few years, ago, we counted from a tower near one of the cities no less than 173 windmills, nearly all of which were in motion; and in the motion of these mills is seen the vast power which has been utilized in raising the water from the lakes. It is easy to understand how water can be raised by such agencies, but where can it be put so as to be out of the way in such a low country? It would seem clear if it was pumped up a few feet and turned upon higher land, it would run directly back into the basins, to be again raised. To comprehend how this difficulty is surmounted, it must be first understood that all Holland is *dyked;* that is, there are embankments, constructed of mud, sand, and twigs, formed against the flow of the ocean, and others raised to keep out the fresh waters of the rivers, and over these embankments the water of the low lands is raised and poured into the sea. If a lake is to be pumped dry, the engineers first dig a ditch around it, two or three feet deeper than the lowest bed of the lake, and from this ditch, which has connection with the lake, the operation of pumping is carried on. The ditch serves not only to cut off all inflowing streams from springs or rivers, but is the reservoir into which flow the waters of the lake as the pumps gradually reduce its level. Around one of these lakes or water basins, in former times, windmills were kept at work day and night, often numbering several hundred. More than a hundred years ago the Dutch had 225,000 acres of land under cultivation which had been formerly the bed of lakes. Perhaps the greatest single work of making farms from land covered with water 14 feet 10 inches below low-water mark in the ocean was commenced in 1836, to drain Haarlem Lake, with an area of 45,230 acres. This enormous labor was completed in 1852, and cost the round sum of $3,592,537, or about $79 per acre.

The preparations necessary to commence draining the lake cost a large sum of money and nearly a year's time. To remove the streams running into the lake, a canal forty miles in length, nine feet deep, and from 125 to 147 feet in width, was dug quite around it, and the earth excavated was made into a solid embankment between the canal and lake. This was not an easy task, for some swamp streams were almost bottomless, and swallowed a world of brush and gravel before the bed rose to the surface of the water. The canal and embankment constructed, and the long dike, also, against the ocean, three steam-engines of 350 horse-power each were procured from England; and to give them a solid foundation in the swamp mud, it was dug out 23 feet, and piles were driven 40 feet below. Each of these engines worked eleven powerful pumps of ten feet stroke. After working two years, and mostly night and day, the water was not out of Haarlem Lake. It was greatly reduced, and in one year more the dry land appeared. It was surveyed and sold for enough to pay all the cost and something over.

We were in Holland in 1856, four years after the water was pumped out, and we found 4000 people living in this basin, in the midst of the most luxuriant gardens and fields, with their fat oxen, and cows carrying burdens of milk such as are seen nowhere else. These people were living securely 15 feet below low-water mark, and 30 feet below high-water mark in the ocean contiguous. It was indeed a most singular spectacle to stand on the dykes and look out upon the ocean covered with ships, their hulls several feet higher than the tops of the chimneys in the houses on the shore. What a wail of agony would go up from these hundreds of dwellings if a *crevasse* should occur in the dykes, and the sea pour in with a vast flood! But the sea will be kept out, if engineering skill and increasing vigilance avails anything. Not a moment, day or night, is this vigilance relaxed, and all materials are at hand to promptly stop any leak that may occur. To pump out the little kingdom of Holland, 3,000,000 of people have expended $1,500,000,000; and to "keep her afloat" it requires an annual expenditure of more than $10,000,000.

Land costing $80 an acre in Holland pays well; it is regarded as a first-class investment, and consequently the rich old burghers of that remarkable country entered upon the gigantic work of pumping out the Zuyder-Zee, which is a salt lake of vast extent. How far this people will push themselves into the sea, or under the sea, it is impossible to conjecture, but if the good Queen of England does not wish her dominions annexed to Holland and the Continent, she had better be taking steps to stop the "progress" of the people of the "low countries."

There is less than two acres of improved land to each inhabitant in the Netherlands, and about one half of this is in grass. The dairies of Holland are the neatest and most convenient in the world, and the Dutch butter commands the highest prices in Europe. The windmills are prominent objects all over the country, and they give to it quite a picturesque effect. They were in use more than 500 years ago, and ponds of 600 acres in extent were drained by their use early in the fifteenth century. We have tens of thousands of acres of low land in New England as good as any in Holland, which can be brought into good tilth without the aid of windmills. All that is necessary is to drain at comparatively small expense, and the prize is in our hands.

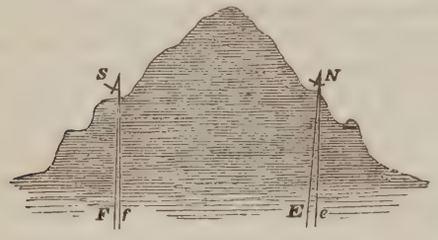
WEIGHING THE EARTH.

AMID the wild and romantic scenery of Perthshire in Scotland, a few miles from the famous Pass of Killiecrankie, there is a little lake, three miles long and perhaps half a mile broad, known as Loch Tummel. On the northern side are pleasant farms, but the southern banks are covered with woods beyond which rises a screen of hills, with one lofty mountain, remarkable for its regular conical outline, towering above them. This lonely peak is called Schehallion (otherwise spelled Schiehallion and Schehallien), and is 3547 feet in height. It is said to have afforded a refuge to King Robert the Bruce after the battle of Methven, in the year 1306. We do not know that it had any other claim to historic renown until a century ago, or, to be exact, the year 1774. Late in June of that year a small party of men pitched their camp half-way up the mountain. They were not taking possession of it for military purposes, though they were armed and equipped with what must have appeared to the untaught peasantry of the district as very suspicious instruments; and the wonder of the

natives could hardly have been diminished when they were told that the strangers had come *to weigh the earth.* Dr. Maskelyne, the astronomer-royal of England, was the leader in the expedition, and it was not until the beginning of November that he had accomplished the work he had in view. A dreary time he must have had that summer and autumn, for the season was the worst that had been known for several years. Three weeks elapsed before he found a day clear enough for a meridian observation of the sun.

But how was the astronomer-royal going to weigh the earth in his camp on the slope of Schehallion? Nearly forty years earlier Bouguer, a French mathematician, had suggested that the weight of the earth might be ascertained by comparing its attractive force with that of a mountain of known dimensions and density; and he had attempted in 1738 to carry out the method in South America by observations on Mt. Chimborazo, but without obtaining satisfactory results. Maskelyne was trying a similar experiment on the Scotch mountain; that is, he was endeavoring to ascertain whether a plumb-line would be deflected from an exact vertical direction by the attraction of the mass of Schehallion. Two stations were selected on opposite sides of the mountain, and their distance apart was carefully measured by triangulation and found to be 4364.4 feet. This being known, and also the latitude of the stations, the direction which the plumb-line at each station ought to take, independent of the attraction of the mountain, could be readily calculated. The precise direction it *did* take could be determined by observations on the stars made with a telescope to which a plumb-line was attached.

Perhaps this will be better understood by reference to the figure. Suppose that at the station



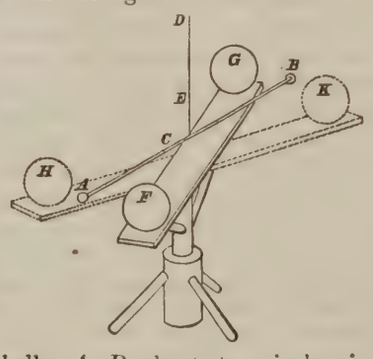
N, the direction of the plumb-line as affected by the earth's attraction ought to be *Ne;* and that at the station *S* it ought to be *S F;* but its actual direction at the two stations is found to be *NE* and *Sf.* Then it is evident that the effect of the mountain has been to draw the plumb-line towards the centre of the mountain, and a little aside from its natural direction towards the centre of the earth.

Now this was what was actually found to take place. The results of more than three hundred observations showed that the two plumb-lines were inclined towards each other at an angle of 53 seconds, while the two lines drawn to the centre of the earth would make an angle of only 41 seconds; that is, the attraction of the mountain had changed the angle to the amount of 12 seconds.

The next thing was to deduce from this observation the density of the earth. The mountain was surveyed, mapped, and measured in the most thorough manner, and its cubical contents exactly determined. The density of the rocks of which it was composed was also ascertained with the utmost precision possible; and from these data its weight was calculated. It was then found by calculation that, if the earth and the mountain were of the same average density, the attractive force of the former upon the plumb-line ought to be 9933 times as great as that of the latter. But the actual effect of the earth on the plumb-line, as deduced from the angles mentioned above, was found to be 17,804 times that of the mountain. Hence the mean density of the earth must be nearly double that of the mountain, or, as it was finally figured out by Playfair, 4.867 times the density of water.

It is an obvious objection to the above method of weighing the earth that we cannot be certain that we have got the exact mean density of a great mass like a mountain, the interior of which it is impossible to examine. Another method, which is free from this difficulty, was therefore tried; first by Henry Cavendish, who had helped Maskelyne in his experiment; afterwards by Dr. Reich, of Freyberg; and finally, in a much more complete way, by Francis Baily, in behalf of the Astronomical Society of London, the expense being defrayed by the British government.

The form of apparatus used by Mr. Baily is shown in the figure below. There are two



small balls, *A*, *B*, about two inches in diameter, carried on a rod *A C B*, suspended by a wire *D E*. By means of a telescope, the positions of these balls were observed from a distance; this precaution being taken, not only to prevent shaking the apparatus, but also because the warmth of the body would create currents of air that might disturb the balls, though they were enclosed in double boxes lined with gilt paper, to prevent as much as possible the influence of such currents. When the position of the small balls had been observed, large balls of lead, *F*, *G*, about twelve inches in diameter, which moved upon a turning frame, were brought near to them; but still they were separated from each other by half a dozen thicknesses of wooden boxes, so that no effect could be produced except by the attraction of the large balls. Observations were then made to see how much these smaller balls were attracted by the large ones. By another movement of the turning frame, the large balls could be brought to the position *H K*. In every case the motion of the small balls produced by the attraction of the larger ones was undeniably apparent. The *amount* of this attraction was ascertained by comparing the vibrations of the balls with those of an ordinary pendulum. The vibration of the balls is caused by the *torsion* or twist of the wire. This torsion increases with the distance the balls are pulled aside, precisely as the force which causes the pendulum to vibrate increases with the distance it is pulled aside. The known laws of the pendulum enable us to compare the attraction of the large balls on the small ones with the attraction of the earth on the small balls, which is measured by their weight. The result gives the earth's density as 5.67 times that of water.

The delicacy of this experiment may be inferred from the fact that the whole attraction of the large balls amounted to only about *one twenty-millionth* part of the weight of the small balls, and that the uncertainty in the measure of this very small quantity did not amount probably to $\frac{1}{10}$ or $\frac{1}{50}$ of the whole.

The absolute weight of the earth may be calculated from its density, since we know its bulk. It may be stated in round numbers as equal to 6,000,000,000,000,000,000,000 tons, of 2240 pounds each.

The attempt has been made to weigh the earth in yet another way, namely, by observing the difference in the rates of the vibration of the same pendulum at different distances from the centre; for instance, at the surface of the earth and at the bottom of a deep mine, or at the base and the summit of a mountain. Experiments made by two Italian astronomers on Mont Cenis gave a density of 4.95; and others by Professor Airy in an English coal-mine gave 6.56. This latter result, for various reasons, is not considered trustworthy. The density of 5.67, as obtained by Baily, is generally accepted as nearer the truth.

MOSQUITOES.

At this time of year, when we have a respite from the buzzing and the blood-thirsty attacks of mosquitoes, we may think calmly of our relations to them, and inquire whether they are really enemies or friends. Nothing was ever created in vain; and if we studied the book of nature enough to understand the habits and offices of all our so-called pests, we should find that they serve some useful purpose for man. There is a glorious field, fruitful alike in pleasure and profit, to the patient investigator or observer, in trying to learn in what way these troublesome creatures are our friends and benefactors.

Experiment has proven that mosquitoes serve no less a purpose in the economy of nature than to prevent, on a large scale, the emanation of miasmatic influences from standing water. The little "wigglers" we see so abundant in summer, near the surface of stagnant water, are the mosquitoes in the first stage of their development. When undisturbed, they can be seen with heads down, and tails — through which they breathe by means of imperfect gills, or respiratory tubes — at the water's surface. But they sometimes remain at the bottom, feeding on decaying matter there. In a few days they shed their skin, cease to wiggle, and float in a torpid state on the surface, or tumble over and over across it when disturbed. In this state they eat nothing, or live on air in homœopathic doses, which they breathe through two funnel-shaped tubes in the top of the back. After a while the skin cracks open, and the mosquito crawls from it and floats for a time, with its thin shell for a boat, till its short, limp wings have grown in both length and thickness. Then it flies off and buzzes about, ready to thrust its sucker into our flesh. The development from the egg to the mosquito requires about four weeks. The sexes couple in the air, and the process is repeated again and again, probably a half-dozen times in the course of one season.

If water stands in the air so protected that the flying mosquito cannot deposit her bowl-shaped mass of eggs in it, it soon emits an offensive odor, and spreads malaria and death on every side; but water freely exposed will contain the larvæ of mosquitoes, which will keep it sweet and harmless. This is an experiment made long ago, by Linnæus, though it seems not to be universally known by naturalists of our day. He placed two barrels of stagnant water side by side, neither of them containing any "wiggle-tails" or other living animals, covered one of them over with gauze, leaving the other uncovered, and the results were as stated above. When there is so much standing water on marsh or swampy ground, in various vessels about every home, and everywhere in crowded cities, it is impossible to compute the injury to health that might result if it were not for these diminutive sanitary agents.

Another very important use for mosquitoes has recently been discovered. The wigglers have been used to excellent advantage by pisciculturists for feeding young fish; and it is said that nothing has yet been found that can contribute more to their rapid and healthy growth. By this use, our hateful pests become, indirectly, a savory and delicate article of diet.

Prof. A. M. Mayer has lately made some very interesting experiments, which have thrown light on the obscure question as to the existence and locality of the mosquito's organs of hearing. That insects have such organs is presumable from the fact that so many of them have the power of producing voluntary sounds; but where the organs are situated has never been definitely known. By watching, under the microscope, the fibrillæ of the mosquito's antennæ or feelers, when he produced certain sounds with his tuning-fork, the professor observed that different sets of fibrillæ were caused to vibrate by the motion of his tuning-fork, according as the pitch and position of the fork were varied. He found that vibrations occur in the greatest degree when the direction of sound is at right angles to the direction of the fibrillæ, and when the fork is so placed as to cause no vibration of a fibrilla, a line extended in the direction in which the latter points will always come within 5° of the source of the sound. From carefully prepared and manipulated experiments of this kind, Professor Mayer thinks he has established a physical connection between the sounds emitted by the female and the co-vibrations of the antennal fibrillæ of the male mosquito; and that the male can always find his consort by going in the direction of the fibrilla which is unmoved by the sound of the female's wing. If these conclusions are correct, the mosquito has a decided advantage over us in his power of determining the direction of sounds. It is supposed that the semicircular canals in our internal ear are for this purpose, but at present this remains a mere conjecture.

Taking the above observations in connection with the conclusions reached by Christopher Johnston, of Baltimore, from his anatomical studies of the mosquito, it seems quite conclusively proven that, as has long been suspected, the antennæ, or the capsules at their base, are the real hearing apparatus of the mosquito. This view is strengthened by the fact that lobsters and crabs, which are structurally allied forms, have distinct organs of hearing at the base of their antennæ. The hearing organs of the male are more complete than those of the female; and we should expect this when we know that he is caught with greater difficulty, and he probably has to find the female in the twilight or darkness by hearing the buzzing of her wings. The male has also more complex and special apparatus for producing sound, and this is as we would expect to find it in order to harmonize with their relative hearing powers. Sounds are produced by the flapping of the wings, or by the expulsion of air through the breathing-holes of the chest, causing a vibration of a delicate valve-like fold just within the opening. The number of flaps which the mosquito makes with her wings, in a second, has been counted by means of an instrument called a siren, which determines the number to be about sixteen thousand.

It is only the female mosquito that torments us with her bite and music. The male is more timid, frequents damp and foul places, as marshes, sinks, and cesspools, and seldom visits the abodes of men. He may be distinguished by his darker color, feathered antennæ, and more developed palpi. "Doctors disagree" as to whether he is physically incapacitated to suck blood, but there is probably no very wide difference in the physical structure of the sexes in this regard. About all that is known on this point is the fact that the female lives on blood, and the male on the juices of flowers and leaves, and kindred food. The beak or sucker is composed of six bristle-like organs containing a double barbed or saw-like piercer, which penetrates the flesh, and all together form a hollow, air-tight tube, through which the blood is sucked into the mosquito's mouth.

There is also a disagreement among entomological savants as to whether the female discharges any poisonous liquid into the wound, which causes the pain and swelling we experience. But no gland to secrete it has ever been found, and the uncomfortable effects which we suffer are doubtless due to irritation caused by the barbed probe which she thrusts so unmercifully into our flesh. This seems sufficient to account for it when we observe the effort she makes to withdraw it, by bracing herself back and pulling with all her might, when she wishes to remove her shaft and "strike ile" in another place.

CHEMISTRY OF A TEAR.

The principal element of a tear is water, which holds in solution a few hundredth parts of *mucus*, and a small portion of common salt, of soda, of phosphate of lime, and of phosphate of soda. It is the salt and the soda that give to tears that peculiar savor which earned for them the epithet of "salt" at the hand of Greek poets, and of "bitter" at that of ours; "salt" is, however, the more correct term of the two. When a tear dries the water evaporates, and leaves behind it a deposit of the saline ingredients; these amalgamate, and, as seen through the microscope, array themselves in long crossed lines, which look like diminutive fish bones. Tears are secreted by an organ called the lachrymal gland, which is situated above the eyeball and underneath the upper eyelid on the side nearest the temple. Six or seven exceedingly fine channels flow from it along and under the surface of the eyelid, discharging their contents a little above the delicate cartilage which supports the lid. It is these channels or canals that carry the tears into the eye. But tears do not flow only at certain moments and under certain circumstances, as might be supposed. Their flow is continuous; all day and all night, though less abundantly during sleep, they trickle gently from their slender sluices, and spread glistening over the surface of the pupil and eyeball, giving them that bright and limpid look which is one of the characteristic signs of health. It is the ceaseless movement and contraction of the eyelids that effect the regular spreading of the tears, and the flow of these needs to be constantly renewed in the way just mentioned, because they not only evaporate after a few seconds, but also are carried away through two little drains, situated in the corner of the eye near the nose. Thus all tears, after leaving the eyelids, flow into the nostrils. To assure himself of this the reader has only to notice, unpoetic as the fact may be, that a person after crying much is always obliged to make a twofold use of the pocket-handkerchief.

HINTS FOR EXPERIMENTERS.

An Experiment with Silver. — Böttger offers the following experiment to show the formation of binoxide of silver and metallic silver by electrolysis. A concentrated solution of nitrate of silver is put in a wide glass cylinder, and two platinum wires, forming the poles of a galvanic battery, are placed in the solution in a vertical position, about three inches apart. Beneath the anode is placed a small watch-glass, and the current from two Bunsen cells started. In a few minutes brilliant needles of binoxide of silver appear on the anode, and becoming too heavy to remain unsupported, fall on the watch-glass beneath. On the cathode an equivalent quantity of pure metallic silver collects in snow-white dendritic ramifications.

To Show the Path of an Electric Discharge. — A correspondent of the *English Mechanic* says: "Take a sheet of glass, wash it well with soda and water, dry well with an unsoaped towel, polish well with a clean wash-leather. Having found the 'striking distance' of your Leyden jar, battery, or electric machine, place the sheet of glass just below the points of discharge, so that they may rest upon it. The shock may now be passed over the sheet, when on removing the glass, and breathing on it, a picture of the track of the electric fluid will be distinctly visible, as clear glass on a dull ground."

HOUSEHOLD RECIPES.

To Take out Bruises in Furniture. — Wet the place well with warm water, then take some brown paper five or six times doubled and well soaked in water, lay it on the place, apply on that a hot flat-iron till the moisture is evaporated, and if the bruise is not gone, repeat the process. You will find after two or three applications that the dent or bruise is raised level with the surface. If the bruise is small, soak it well with warm water, and hold a red-hot poker very near the surface, which is to be kept continually wetted, and you will soon find the indentation vanished.

Home Repairs of Plastered Walls. — Small holes in white plastered walls can be easily repaired without sending for the mason. Equal parts of plaster of Paris and white sand, — such as is used in most families for scouring purposes, — mixed with water to a paste, applied immediately, and smoothed with a knife or a flat piece of wood, will make the broken place as good as new. The mixture hardens very quickly, so it is best to prepare but a small quantity at a time.

Practical Chemistry and the Arts.

THE SCIENCE OF ADULTERATION.

BY S. P. SHARPLES, STATE ASSAYER.

IV.

THERE is probably no article for sale in the market which is so universally and justly suspected of being adulterated as alcohol in its various forms. By the term alcohol I intend to designate all liquors, whether fermented or distilled, that contain this principle as one of their chief constituents.

The use of these drinks runs back further than any tradition. The Bible speaks of the use of wine by Noah, but the account gives us no reason to suppose that he discovered the manufacture of wine. The discovery of the method of distilling wine, and thus producing a much more potent spirit, has been ascribed to an Arabian chemist who lived in the eleventh century. But the use of distilled spirits is much more recent than this. Shakespeare's characters do not get drunk on whiskey, gin, or brandy, but on ale and wine of various kinds.

The intoxicating power of all these liquids depends almost wholly upon the amount of alcohol that they contain, but the nature of the intoxication is very much modified by the substances other than alcohol found in them. The intoxication produced by beer, cider, or wine is very different from that produced by brandy or whiskey, and that produced by these latter articles differs from that produced by pure alcohol. The purer the alcohol and the less of foreign ingredients that it contains, the less likely it is to give rise to bad after-effects. From some recent experiments, Dr. Richardson, of London, came to the conclusion that methylic alcohol is less injurious than common alcohol, and he says: —

"I have of late years, when compelled to allow the administration of alcohol in some form, recommended this methylic lighter spirit, and, I am satisfied, with better results than if the heavier or ethylic spirits had been employed. I have ventured also to suggest that in many cases other physicians might follow the same practice with advantage, for methylic alcohol is much more rapid in its action and much less prolonged in its effects than common alcohol, and what is of most importance, it demands the least possible ultimate expenditure of animal force for its elimination from the body. This latter fact, I repeat, is of great moment, for in the end all these alcoholic fluids are depressants, and although at first by their calling vigorously into play the natural forces, they seem to excite and are therefore called stimulants, they themselves supply no force at any time, but cause expenditure of force, by which means they get away out of the body and therewith lead to exhaustion and paralysis of motion."

Butylic alcohol, and in more marked degree amylic alcohol or fusel-oil, even in small doses, produces all the symptoms of delirium tremens. Now it is these very alcohols that give to distilled liquors their peculiar flavors. The flavor of whiskey is largely due to the fusel-oil that it contains. Fusel-oil is often so abundant in whiskey distilled from the potato, as to make it poisonous when taken in even small quantities.

During our late war the Sanitary Commission made a careful inquiry into this subject of alcoholic stimulants, and recommended for use pure alcohol diluted with more or less water according to circumstances. They had come to the conclusion that it was almost impossible to get pure liquors or to test them after having got them. This 95 per cent. alcohol mixed with about its own bulk of water would be equivalent to whiskey or brandy, and when mixed one part to four of water would equal sherry or port. Alcohol can be obtained absolutely pure, while scarcely any liquor containing alcohol can be obtained pure with certainty. It is a notorious fact that the higher the price of alcoholic liquors, the more they are liable to be adulterated and imitated.

Whiskey can be obtained pure in all the large cities, and is generally pure, provided that some particular celebrated brand is not sought for. The common corn whiskey, from two to three years old, that may be found on sale at most of the dealers, is generally free from all but a trace of fusel-oil and contains no other injurious substances. This is the basis for most of the fancy brands of whiskey and indeed of most other spirits, although for the manufacture of those in which the whiskey flavor would be too strong, it is customary to purify it still further and produce the article known as proof spirits. With proof spirits and the skilful use of various essences, and in some cases of a little of the genuine liquor, the mixers are able to produce on a few hours' notice an exact imitation of any celebrated brand that may be called for. The same thing is true of wine, the only requisites being some cheap wine or clarified cider, proof spirits, and flavoring extracts, or some of the genuine wine for flavoring.

We can lay down as a general result of much inquiry: —

1st. That in buying any liquors the chances are about even that they will be adulterated in some way.

2d. That whatever is present beyond mere alcohol, be it sugar, fusel-oil, or anything else, will be more or less injurious.

3d. That pure alcohol, free from any injurious substances, can generally be obtained.

4th. That this is the least objectionable of all the forms in which it is found, doing the work required of it with less bad effects.

And, in conclusion, that while in some cases alcohol may be a valuable medicine, it can only be regarded as a drug whose continued use cannot fail to end in harm, and as one which should no more be taken without the advice of a physician than opium or strychnine.

MEMORANDA IN THE ARTS.

LEATHER IN THE USEFUL ARTS. — A detailed account is given in *Die Gartenlaube* of a new branch of industry which has been undertaken in Vienna, and on a large scale, namely, the manufacture of leather jewelry. Leather flowers and imitations of fruits, especially clusters of grapes, have long been produced in great variety and beauty from this material, and are largely used in the embellishment of picture-frames, brackets, work-boxes, and numberless other articles of *bijouterie*. In the manufacture of clothing, leather enters to a great extent in Northern Europe, especially Russia and the upper part of Sweden. Immense quantities of trunks, valises, and other travelling requisites are made wholly or in part of the same. In the fancy articles of industry, leather of the finer qualities is extensively used, the Vienna and Paris goods of this class being world-renowned. Leather tapestry is again coming in vogue; it is on some accounts far superior to any other, and its durability is very great.

A NOVELTY IN MAP-MAKING. — A recently patented "notion" for a map consists in having those portions intended to represent the rivers, lakes, and oceans filled with actual water. This is done by attaching the map to a back of wood of sufficient thickness. The rivers, etc., are dug out, filled with water, and glazed. Such maps may be hung upon the wall in the usual manner.

IRON-CLAD SHIPS NOT A MODERN INVENTION. — The use of iron plates to protect vessels is far from being of as recent date as is generally supposed. During the twelfth century the Normans covered their ships from the water-line up with an iron casing, terminating in a ram on the bow. Still earlier they had adopted a system of protecting the upper works with metal shields. In 1534 Peter of Arragon ordered his ships to be iron-plated, in order to protect them from the burning missiles then in common use. In 1530 the squadron of Andrea Doria contained a vessel built by the Knights of St. John, which was armored with several thicknesses of iron. At the battle of Lepanto several ships protected their batteries with bars of iron. For two centuries no progress seems to have been made. In 1782, at the siege of Gibraltar, an engineer officer constructed six ships, which were the types of the modern iron-clad. They were covered with an armor of hard wood, leather, and bar-iron. It is said that they resisted the fire of the forts for a long period, but were finally sunk by red-hot shot.

THE MAGIC OF MODERN INDUSTRY. — An English writer says: "Jove took thunder in his hands and threw it on the earth as a soldier threw hand-grenades, and so great a feat was this accounted in this god that the books which tell of it are still the school-books of the colleges. But our plain men of business have brought the thunder from heaven and have set it to work not to destroy but to help mankind to live. The lightning may now be seen in the workshops, stripped of its flashes as a workman is stripped of his coat, and soberly at work. It may be seen also reduced to the office of a mere errand-boy, carrying the messages of the merchants a hundred miles a second for a mere shilling. Once upon a time the beings that could disappear into the side of a mountain in an instant and reappear on the other side, overpassing rivers, ravines, and precipices, fleet as the eagles, were only gnomes or demons, or other creatures of the imagination. Nowadays such beings are cotton-spinners, weavers, iron-founders, merchants, and so forth, leaders to thousands of other human beings who follow in the tracks these have made."

THE WESTERN STEAMBOAT PILOTS.

WE find in *Iron* some interesting articles on "The Western Steamboats of America," by Mr. J. Richards. The writer pays the following tribute to the pilots of these vessels: "Pilots are a class *sui generis*, and how it is possible for a man to acquire the knowledge possessed by a Pittsburg and New Orleans, a St. Louis and New Orleans, or a St. Louis and St. Paul pilot, is one of the wonders that cannot be rationally explained. From Pittsburg to New Orleans, for instance, is 2000 miles — hundreds, yea, thousands of bars, chutes, snags, and obstructions of every imaginable kind lie in the river. The path of the steamers is so narrow in places that 100 feet to the right or the left would 'lose the boat,' as they say; and throughout this 2000 miles, through the darkest nights, through storms, at high water or low water, these men guide the steamers moving from twelve to twenty miles an hour, and yet manage to clear all. The writer has passed many times over this route, continually consulting guide books and pilot books, but

long before the last end was reached the first of the journey was oblivion. One thing stops the pilots, and only one thing, which is fog; this, however, is rare, except for a short period during the autumn. To illustrate the difficulties to be encountered in steering, it may be mentioned that in at least one place between St. Louis and St. Paul, on the upper Mississippi, the channel is so tortuous that descending steamers stop their engines and float through; the banks are composed of soft alluvial deposits, and the boats often strike, and are turned completely around, often several times, before they come through. For the smaller streams, and especially with stern-wheel boats, three *balanced* rudders are often employed; these are pivoted almost in the centre, so that but little force is required in setting them hard over. The steering wheels are from 8 to 12 feet in diameter, and a strong man at one whirl will send these three immense rudders from port to starboard or the reverse, the flat-bottomed boat turning so suddenly as to surprise or even alarm one who sees it for the first time."

PRACTICAL RECIPES.

To Give Iron Wire a Silvery Look. — According to a German recipe, the iron wire is first placed in hydrochloric acid, in which is suspended a piece of zinc. It is afterwards placed in contact with a strip of zinc, in a bath of two parts of tartaric acid dissolved in 100 parts of water, to which is added three parts of tin salt and three parts of soda. The wire remains about two hours in the bath, and is then made bright by polishing or drawing through a drawing iron. The process can also be used for whitening other forms of iron.

To Coat Iron with Brass. — The *Scientific Press* describes a method of covering iron wire with brass, without the use of a battery. The process is a very simple one, and consists first in placing the clean, bright wire in a solution of sulphate of copper, when it immediately becomes covered with a thin film of copper. It is then covered with a paste of pure oxide of tin, and heated to a temperature high enough to fuse the copper. Care must, of course, be taken to prevent volatizing the tin.

To Protect Maps, Pictures, etc. — The London *Furniture Gazette* gives this recipe: Coat a plate of glass thinly and uniformly with a warm mixture of one quarter of an ounce of ox-gall and one quart of a solution of glue, which would form a stiff jelly on cooling. When the film is well set, render it insoluble by immersion for two or three hours in a solution of acetate of alumina, which may be formed by dissolving one ounce each of alum and of acetate of lead in a pint of water and decanting the clear liquid from the sulphate of lead formed. Then wash and rinse well, give it an additional thin coating of weaker glue solution, and lay the picture, slightly but uniformly moistened, upon it, face downward; smooth out by gentle rubbing, place in a warm room three to four days, and remove from the glass when thoroughly dry, by cutting the film around it. The back of the picture may be coated in a similar manner, and it will then lie flat without a frame.

Metallic Cement. — An alloy of copper, prepared as follows, is capable of attaching itself firmly to the surfaces of metal, glass, and porcelain. From 20 to 30 parts of finely-divided copper (obtained by the reduction of oxide of copper with hydrogen, or by precipitation from solution of its sulphate with zinc) are made into a paste with oil of vitriol. Seventy parts of mercury are then added, the whole being well triturated. When the amalgamation is complete, the acid is removed by washing with boiling water, and the compound is allowed to cool. In 10 or 12 hours it becomes sufficiently hard to receive a brilliant polish, and to scratch tin or gold.

Agriculture.

FARMERS' GIRLS.

Much has been said regarding farmers' boys, their education, employment, prospects, etc., but very little concerning farmers' girls. Our worthy farmers' wives will persist in presenting to their husbands a fair sprinkling of girls, and since it is not fashionable here to follow the Chinese custom of drowning the female innocents at the time of birth, some provision must be made for their welfare, some interest must be taken in their fortunes as they grow up to womanhood. The lot of farmers' girls, as a general thing, is not very enviable; they are obliged to submit to many privations and inconveniences, especially when living in retired, out-of-the-way places. Farmers' sons do not usually remain long enough at home to reach the age of manhood, and therefore the girls do not have the society of the opposite sex, and their matrimonial prospects are not promising. Household duties do not give them all the employment they need, and out-of-door work is not regarded as congenial or proper for woman. Their fathers have but little ready money, and therefore their wardrobe is painfully scant, often too much so for health and comfort in winter. The girls attend the district schools, and thus acquire some education, but not enough to fit them for teachers; and unless a brother, cousin, or uncle steps in and supplies funds so that they can travel and visit the cities, they must remain at home listless and lonely. This description applies to girls in a large number of our New England farm-houses before they reach the age of eighteen or twenty. At this age they feel compelled to seek employment in some manufacturing establishment, and thousands of farmers' girls may be found at the looms and spinning-jacks in the factories at Lowell, Lawrence, Manchester, and elsewhere. They are excellent, virtuous girls, possessing youth, beauty, and health, but their condition is not pleasant nor their associations desirable. They must, however, have money to supply themselves with clothing, and this they could not have at the farm; hence they are necessitated to become operatives in factories for many long and weary years.

A complete revolution has been effected in the position and welfare of farmers' daughters within a third of a century, and it is not difficult to point out the cause of this. There had always been, up to about the commencement of that period, some domestic industry in farmers' houses which afforded employment to the daughters, and the opportunity of earning something at home. Knitting socks, spinning, and weaving wool and flax fabrics gave employment in the earlier periods of our history; then, as woolen machinery was introduced, the straw bonnet and palm-leaf hat industry kept the girls at work under the paternal roof, and supplied them with spending-money; the shoe interests also gave support to thousands. The girls were contented and happy at home whilst their minds and fingers were busily employed; now, machinery used for every conceivable kind of work has banished from households all industrial employments.

The great need of the present time is some kind of home industry which will afford farmers' daughters an opportunity of earning a little money. The development of such an industry would prove a positive blessing. Now, is there not ground for hope that something will arise to meet this want? We think there is. There is at the present time, and probably there always will be a prompt demand for whatever is elegant, durable, and useful. The fingers work many kinds of fabrics more deftly and elegantly than is possible by machinery. The rich laces of Brussels are of this nature, and there is a kind of hosiery, now much sought after, which can only be knit by hand. There is a limit to perfection in the work of wheels, levers, and cams, but there is hardly a limit to the skill of human fingers; and when anything is produced that is rare and beautiful, it will find a ready market and bring a large price.

We are fully of the opinion that many kinds of socks, gloves, laces, and articles of women's wear can be made so excellent and durable, in the family, as to command a ready sale at remunerative prices. Good home-made socks, from sound home-raised wool, will bring better prices now than ever before; they are certainly in demand. We wish for a dozen pairs ourselves, and if it were not for the fear that too many would respond, we should say to the farmers' daughter who reads this, Send along your bundle of warm socks with bill C. O. D., and the money to pay will go by return express. We believe farmers' girls are not to be compelled to enter woolen or cotton factories to find employment. With the exercise of a little patience, ingenuity, and skill, many industries can be devised and pursued profitably at home, away from the temptations and hazards of mill life.

MR. LAWSON'S BOOK.

Our friend Mr. William Lawson, formerly of Blennerhasset Farm, Cumberland, England, must have achieved satisfactory success, if in writing his book recently published by the Longmans ("Ten Years of Gentleman Farming at Blennerhasset with Coöperative Objects") his design was to attract attention and provoke controversy. It is interesting to read the criticisms of the work in the English journals. Some shower upon it abundance of ridicule, others regard it as too absurd and silly to attract notice, while others still are disposed to look upon it as one of the most interesting and important books issued from the press during the year. The book is certainly *sui generis*. We have several times spoken of Mr. Lawson in the Journal, and of his remarkable experiments in agriculture. A visit to Blennerhasset Farm, two years ago, afforded opportunity to see what he was doing, or rather what he *had been* doing, with his land, for at that time his experiments had come to an end; the ten years were up. His yards were full of ponderous steam-ploughs, enormous harrows, threshers, mowers, etc., all in a state of rust and dilapidation. His coöperating family had dispersed, and his chemist, Mr. Hunter, was picking up his retorts, beakers, and test-tubes, prior to a speedy leave-taking. The whole scene was amusing and perhaps instructive. A look at the fields stretching away over the green hills of Cumberland afforded evidence of much high cultivation, and the huge stacks of hay and straw

around the farm-house proved that they had borne heavy burdens.

As an experiment in coöperative farming in England, the whole thing was evidently a failure, and Mr. Lawson sunk thousands of pounds in the undertaking. The idea of bringing in the English farm-laborers to share in the products and profits of the farm, and in its management, strikes the English aristocracy as something very absurd. It was an unheard-of proceeding for a man of wealth and position to join his interests with common working-people, and offer them a pecuniary interest and coöperation in cultivating his landed estates. Mr. Lawson is an honest man, and writes with great candor. He remarks as follows upon his associate laborers : —

" The laborers had been accustomed all their lives to have their labor dealt with by those who simply tried to buy it as cheap and sell it as dear as possible, and were, of course, unable to fall in with an entirely different order of things at a moment's notice. . . . But if they doubted my *will* to benefit them by coöperation, perhaps they were still more doubtful of my *ability* to do so. They saw me buying and selling, but *not getting gain ;* and under these circumstances it was not to be wondered at if simple-minded laborers supposed that no contrivance could make my coöperation profitable to them. Moreover, they probably considered my practice of trying experiments upon the farm a great objection to coöperating with me. For not only were the experiments I thought proper to have tried expensive, — without the prospect of direct profit to myself, — but the great importance to the public of intelligently tried agricultural experiments did not then seem to be realized by farmers generally, much less by farm-laborers not at all accustomed to scientific investigation, or even to calculation of any sort."

Mr. Lawson's farm experiments continued from 1862 until 1872, and at this time he sold his estate to his brother, Sir Wilfrid Lawson, the distinguished reform member of Parliament. He has made several visits to this country, and is at present in California spending the winter. Several years ago he spent some time with us at Lakeside Farm, and became much interested in the experiments we had in progress. His extensive farm accounts and balance-sheets, which came to him regularly from England, were discussed freely, and it was evident his schemes could not prove financially very brilliant, however much he was striving to advance scientific agriculture and benefit his people.

The book is worth reading. It may be procured from England through book importers in this city or in New York.

ENGLISH AND AMERICAN CHEESE.

The *Agricultural Gazette*, of London, in a recent article on the factory system in cheese-making, laments the deterioration in the quality of English cheese, while it pays a high compliment to the American product. The following are brief extracts from the article : —

At a very moderate computation the farmers of Great Britain lose annually above a quarter of a million pounds sterling by making bad and inferior cheese from good and rich milk. If we took an estimate once given by Dr. Voelcker, of the proportion of cheese " spoilt in the management," the loss would very far exceed half a million pounds yearly ; and we should not be surprised if it does really amount to quite that large sum. Only fancy a loss in one year (which is avoidable, for it is not much dependent upon weather or seasons) of half a million pounds sterling ! In this age of agricultural progress the thing seems past belief. . . .

We have received this year from America cheese of the value of £4,483,636, and the export trade is set down in the last report of the " Butter and Cheese Exchange of New York " at less than half the total make of cheese. Hence will be seen at once the immense progress the factory system has made since 1851 — the date of the establishment of the first cheese factory. And the improvement in the quality of the cheese made has been one of marked progress. At the large stores in Liverpool and London we shall find some of surpassing excellence.

The question naturally arises, why England should let America strip her of her laurels in the making of cheese. In nearly every county in England we hear complaints to the effect that in place of improving, there has been, during the last twenty years, the reverse as to the quality of the cheese now produced. In a discussion before the Farmers' Club in London a few years ago, this not very creditable fact was admitted by several speakers, all of whom were fully competent to give an opinion upon the matter.

APPLES AS FOOD.

Apples are so abundant this season that it may be well to call renewed attention to their value as an article of diet. We can fully indorse the following from the English *Garden :* —

With most of us the value of the apple as an article of food is greatly underrated. Besides containing a large amount of sugar, mucilage, and other nutritive matter, apples contain vegetable acids, aromatic qualities, etc., which act powerfully in the capacity of refrigerants, tonics, and antiseptics ; and if freely used at the season of mellow ripeness, they prevent debility and indigestion, averting, without doubt, many of the ' ills which flesh is heir to.' The operatives of Cornwall consider ripe apples nearly as nourishing as bread, and far more so than potatoes. In 1801, — which was a year of much scarcity, — apples, instead of being converted into cider, were sold to the poor ; and the laborers asserted that they could ' stand their work ' on baked apples without meat, whereas potato diet required the addition of meat or other substantial nutriment. The French and Germans use apples extensively. The laborers depend upon them as an article of food, and frequently make a dinner of sliced apples and bread. There is no food cooked in so many different ways in our country as apples, nor is there any fruit the value of which, as an article of nutriment, is so great and yet so little appreciated.

The same journal gives the following among other recipes for cooking apples : —

1. Stew six or eight good baking apples (pared and cored) until they are tender, let them cool, and mix them with the yolks of two eggs and enough sugar to sweeten them. Spread this mixture on a dish, cover the top with fine bread-crumbs and a small quantity of dissolved butter, and bake for a quarter of an hour. 2. Boil 1½ lbs. of loaf sugar in a pint of water for a few minutes, add 2 lbs. of good cooking apples ; let these all boil together until the mixture is tolerably stiff ; just before removing it from the fire, add the grated rind of two lemons ; press it into moulds which have been previously dipped into cold water (and not wiped) ; when this *gâteau* (as it is called) is turned out on a dish, ornament it with blanched almonds ; pour a custard or some whipped cream round it. 3. A very nice way of using apples is to slice some into a dish as for a pie, with some sugar and lemon peel. Make a thick custard of corn flour, milk, and sugar, flavored with almonds ; pour the custard on the apples, and bake an hour, or till the custard is brown.

HINTS FOR THE FARM AND HOUSEHOLD.

A Cheap and Durable Green Paint. — The London *Journal of Horticulture* commends the following as a cheap and durable green paint : " Half a pound of black paint with half a pound of yellow ochre ground into it, and well stirred together. These will make a paint of an olive-green, varying in color according to the quality of the yellow ochre ; but a little more of the black or of the yellow may be added to produce either a deep ivy-green or a lighter shade, up to the palest aucuba-leaf. When the color required is arrived at, a pennyworth of patent dryers is to be added. This paint may be kept for a considerable time in a cool place, and with two or three inches of water over it. When required for using, take a small portion out into a pipkin and thin with equal parts of raw linseed oil and turpentine. On no account should boiled oil be used, as this causes the paint to dry on the surface while it remains soft within, and renders it very liable to blister when exposed to the sun. One coat of this paint will be found to cover very fairly, but it is always best to lay on the first coat very thinly, and let it become thoroughly dry and hard before completing with a second coat."

A Hint on Feeding Horses. — The London Omnibus Company has lately made a report which furnishes some interesting information not only to farmers but to every owner of a horse. They have in use no less than 6000 horses. Of this number 3000 had for their feed bruised oats, 16 lbs. ; cut hay, 7½ lbs. ; straw, 2½ lbs. : and the others unbruised oats, 19 lbs. ; uncut hay, 13 lbs. The horses which were fed on the former, and consumed 26 lbs. per day, could do the same work as well, and were kept in as good condition, as those receiving 32 lbs., thereby causing a saving of 6 lbs. on each horse, amounting to £60 ($300) per day, or £21,900 ($109,500) per annum, on the company's 6000 horses.

Burning Kerosene Oil. — The following, from *Harper's Weekly*, is worth making a note of : " If there is one thing more disagreeable than another after taking a brisk evening walk, it is to enter a room filled with the suffocating fumes of kerosene oil. In the city, where gas is universally used, we escape the misery ; but in the country it is a common infliction. The inmates of the room may be unconscious of it, or have become accustomed to the unwholesome odor. The pernicious practice of using lamps filled with kerosene, and having the wick turned down too low, is usually the cause of the suffocating fumes ; the gas which should be consumed by the flame passes into the atmosphere. It is unnecessary to say that using kerosene in this way is a most unhealthy practice. Only good oil should be burned, and the wick should always be raised to a proper height."

NOTES AND MEMORANDA.

The Germination of Seeds. — A French journal states that two chemists of the Academy of Brussels have made some interesting discoveries relative to the germination of seed. It is well known that the action of the air and the presence of water are necessary conditions ; but the mode of action has not been understood. It is now ascertained that the effect of water is to soften the covering of the seed so as to render it permeable by gas. When they have imbibed sufficient moisture, the tissues of the seed acquire the property of condensing gases. This condensation cannot take place without producing heat ; the oxygen, therefore, which has penetrated the tissues is sufficiently heated to cause oxidation and the consequent awakening of vegetable life. The condensation of the gases in the seed is the first of germination. If this condition is not produced, whether from want of water or because the air cannot reach the seed, there can be no formation of the immediate principles necessary for

the evolution of the germ. These experiments are very interesting from a practical point of view, as they enable the cultivator to determine the influence which the solidity of the soil, the dryness or the excess of moisture, the depth of earth in which the seed is placed, may have on the success of the sowing. Experience has already taught us much on these matters, but scientific methods, corroborating, as they do, the observations of practical men, can alone point out the sure means to bring about the desired results.

Agriculture and Horticulture at Philadelphia in 1876. — The Horticultural Hall, one of the five principal buildings of the Centennial Exhibition, is to be built of glass and iron, 310 feet long by 160 wide, giving an area of 1¼ acres. The greater portion of this space is devoted to the grand conservatory, which is 227 feet by 77, and occupies the central portion of the building, there being between it and the outer walls on either side the warm and the cold houses, and at the ends the dining-halls, offices, etc. There will also be a number of subsidiary structures — a Victoria Regia house, domestic and tropical orchard houses, a grapery, etc. The surrounding grounds will be arranged for out-door planting, which will constitute the larger portion of the horticultural display. It is purposed to plant, at least a year before the opening of the exhibition, the representative trees of all parts of this continent. The visitor, it is intended, shall see side by side the full variety of the forest products and fruits of the country, from the firs of the extreme north to the oranges and bananas of Florida, and grapes and other fruits of California. In addition to the horticultural display, careful provision will be made for trials of agricultural machinery. A considerable area will be put into crops, for the purpose of testing the mowers and reapers and other agricultural implements offered for competition.

American Woodlands. — In a paper on "The Distribution of American Woodlands," read by Professor William H. Brewer, of New Haven, before the American Association for the Advancement of Science, the author stated that the flora of the United States is believed to contain over 800 woody species, and over 300 trees. Of these trees, about 250 species are somewhere tolerably abundant; about 120 species grow to a fairly large size; 20 attain the height of 100 feet; 12 a height sometimes of over 200 feet; and a few, perhaps five or six, a height of 300 feet.

The Sheep in History. — Mr. R. Owen remarks: "The most ancient records of our race, both sacred and profane, tell us of the sheep as already an animal domesticated for the food and clothing of man, and it is a significant fact that both the Scythians of the elevated plains of Asia — who according to Herodotus obtained felt, and according to Strabo food, from their flocks — and the patriarchal Hebrew shepherds of the plains of Mesopotamia — the earliest instances of pastoral life — dwelt in that part of the earth where the wild argali (*Ovis ammon*) still exists in the greatest numbers.

The South and the North. — A Georgia journalist draws this picture of Southern dependence on Northern industry: "A Georgia farmer uses a Northern axe-helve and axe to cut up the hickory growing within sight of his door, ploughs his fields with a Northern plough, chops out his cotton with a New England hoe, gins his cotton upon a Boston gin, hoops it with Pennsylvania iron, hauls it to market in a Connecticut wagon, while the little grain that he raises is cut and prepared for sale with Yankee implements. We find the Georgia housewife cooking with an Albany stove, and even the food, especially the luxuries, imported from the North. Georgia's fair daughters are clothed in Yankee muslins, and decked in Massachusetts ribbons and Rhode Island jewelry."

Boston Journal of Chemistry.

Jas. R. Nichols, M. D., *Editor.*
Wm. J. Rolfe, A. M., *Associate Editor.*

BOSTON, MARCH 1, 1875.

PUBLISHERS' NOTICE: THE PREMIUMS.

Have the young readers of the Journal noticed the generous premiums offered by the publishers for obtaining subscribers? This column in the advertising department is certainly worth your careful attention. They do not offer "chromos" or other cheap articles as a reward for effort, but *cash, solid gold coin.* Read! For the largest list of subscribers which any one will send to them in the thirteen months between December, 1874, and January, 1876, they will give *seventy-five dollars*, and this they will pay to the fortunate canvasser in *new one dollar gold pieces fresh from the mint;* for the next largest list, *fifty dollars* in the same variety of coin; for the next, *twenty-five dollars.* Nine months remain in which to work for these desirable premiums. No one need hesitate to work to obtain the golden prizes. The chances are good, and the effort a worthy one. If you should not happen to obtain either of the prizes, you will certainly receive twenty-five cents for every new subscriber's name you send in, and this will be paid in gold coin if more than four are secured. As fast as names are obtained, forward them to the office with the remittance of one dollar for each, and they will be credited upon a book kept for the purpose, so that at the end of the year you will be sure to receive your reward.

WHAT SHALL WE EAT?

The paper by Dr. Cutter in the last issue of the Journal, upon the chemistry and physiological effects of fine flour, has awakened much interest and inquiry among our readers. There can be little doubt that the questions asked by the writer are of much importance to every one, and that the exclusive use of bolted flour in bread-making is opposed to the science and knowledge of the age in which we live. We grind that noble grain, wheat, in our powerful mills, and then with the bolter remove from the powdered grain everything that resists the action of the stones, so as to retain for use only the starchy portion, which is elegant to the sight. In the rejected portions are found the most important nutritive principles, and these, in the form of "shorts" and "fine feed," we give to our horses and our cows. As we have looked into the "bins" at the farm, filled with these rejected articles of human food, the exclamation has been often forced from us, "What a pity!" Pity indeed it is that "fashion" should override interest and physical well-being; for nothing but fashion holds the *snow-white* wheaten loaf in its place upon our tables.

If this must continue, we would suggest to those who desire to obtain all the elements in food necessary to good health, to procure the wheat phosphates and nitrogenous compounds by a free use of milk. If a generous milk diet is associated with the white bread, the evils of imperfect nutrition may be avoided. Nothing excites the lacteal secretion in cows like the miller's "fine feed," and we find in the milk-pail in new associations the rich elements we reject in the grains of wheat. Very few indeed can obtain pure milk and cream, but every family ought to be able to obtain whole wheat flour, in its best condition. At the present time, it is the practice to a large extent among millers, to grind the finest, soundest wheat into fine flour, and the poorest into what is called "Graham flour." This term "Graham flour" ought no longer to be used. It is a kind of general name given to mixtures of bran and spoilt flour, to a large extent unfit for human food. What we need is good, sweet, *whole wheat* flour, finely ground, and securely put up for family use. This article we do not find in the market, and the Western miller who will give his earnest attention to furnishing such flour will realize a fortune speedily. The brown loaf made from whole wheat is to our eye as handsome as the white. It can be made with all the excellences of the white, so far as lightness is concerned, and it is sweeter and more palatable. With this loaf we secure all the important nutritive principles which the Creator for wise reasons has stored up in wheat.

CLIMATIC OBSERVATIONS.

A view of the weather in Eastern Massachusetts during the last year, compared with preceding years, will be seen as presented below, from observations taken three times a day; namely, at 7 A. M. and at 2 and 9 P. M.

First, as to Temperature.

	Jan.	Feb.	Mar.	Apr.	May.	June.
1874	28.91°	24.98°	34.04°	38.17°	56.76°	66.82°
Last 10 years .	21.25	23.09	29.94	43.38	54.66	66.36
	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1874	70.77°	65.83°	62.23°	50.93°	37.45°	28.25°
Last 10 years .	70.26	67.34	59.60	47.50	35.08	24.51

The average for the entire year 1874 was 47.18°, while the average for the last ten years was 45.26°, showing the year 1874 to be a very warm one, by an excess of nearly two degrees daily. The next warmest year of the ten was 1872, when the average was 46.90°. The coldest year of the ten was 1868, when the average was only 41.85°. The range in 1874 was 99°, or between —5° and 94°; during the ten years 117°, or between —22° and 95°.

If we compare the different seasons of the year, winter, spring, summer, and autumn, including the entire months of December, January, and February for winter, and so on, we have the following result:

	Winter.	Spring.	Summer.	Autumn.
1874	28.29°	43.00°	67.81°	50.20°
Ten years . .	22.77	42.67	68.05	47.40

showing every season last year warmer than the average of the last ten, except the summer, which was but a trifle below, only 0.24°. The winter of 1873–74 was peculiarly a warm one, being 5.52° above the average; the autumn was also very warm and pleasant. The coldest winter of the last ten years was in 1867–68, when the average stood at 16.17°, or 12.12° colder than last winter. The warmest summer of the ten was in 1872, when it stood at 71.71°; while the coldest summer was in 1869, when it stood at 64.71°, or 3.10° colder than last summer, and just *seven* degrees colder than the warmest.

Secondly, the Aspect of the Sky. — Observations made at the same hours. "Fair" implies a majority of the sky clear; "cloudy," a majority cloudy; "overcast," no clear sky. "Rainy" and "snowy" indicate rain or snow at the hour of observation. The *yearly* results are here given for mornings, noons, and evenings, indicated below by the letters *M, N,* and *E.*

	Fair.			Cloudy.			Overcast.			Rainy.			Snowy.		
	M.	*N.*	*E.*	*M.*	*N.*	*E.*	*M.*	*N.*	*E.*	*M.*	*N.*	*E.*	*M.*	*N.*	*E.*
1874 . .	184	220	213	81	76	47	65	25	68	24	32	26	11	12	11
Ten years	196	216	211	65	73	45	61	34	64	27	28	32	14	15	13

By uniting the daily observations, we have

	Fair.	Cloudy.	Overcast.	Rainy.	Snowy.
1874	617	204	158	82	34
Ten years . . .	623	184	159	87	42

By dividing these numbers by three, we have the number of *days* during the year, fair, cloudy, etc. Thus the average of fair days yearly for the last ten years has been 208 nearly, 61 cloudy, 53 overcast, 29 rainy, and 14 snowy. It will also appear by the above, that we have more fair noons and evenings than mornings, but fewer overcast noons than mornings or evenings, and fewer cloudy evenings than mornings or noons, and yet more rainy evenings; while it snows, morning, noon, and evening, with nearly equal frequency. But these figures only approximate the exact truth. The longer and more accurately such observations are made, the more correct the result. Should these comparisons be made for the different seasons of the year, and even for each month, other curious and it may be useful results might appear.

Thirdly, the Amount of Rainfall. — Here observations have been made for only the past six years. A rain and snow gauge was made under my direction, which gives very clearly the amount of rain, or melted snow, to the one hundredth part of an inch. It measures the snowfall far less accurately, as this often melts in contact with the instrument. Hence the snow measure has been less frequently and less satisfactorily made, although the melted snow is carefully measured and included in the results below.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.
1874 . . .	3.53	3.70	1.30	6.30	3.50	4.60	1.43
Six years .	3.82	4.04	4.71	4.15	3.47	2.96	2.36

	Aug.	Sept.	Oct.	Nov.	Dec.	Year.	Snow.
1874 . . .	4.85	1.05	.75	1.62	1.45	34.08	61.0
Six years .	4.80	2.88	5.57	3.13	3.52	44.98	59.5

The average rain (and melted snow) for the first five years observed was 47.16 inches, while the last year's fall was only 34.08 inches, reducing the average as above, to 44.98. The highest rainfall was in 1869, when it was just 50 inches, causing a severe freshet in October, in which month the fall was over 13 inches, the largest fall in one month during these six years. The next largest was 10.03 in August, 1872; the next in March, 1871, just 10 inches. The lowest amount was in June, 1873, when it was zero.

It will be seen by the above that our heaviest rains have fallen in October, next in August, then in March, April, etc., while the lightest are in July, September, and June. The remarkable falling off in rainfall last year was chiefly during the last six months, except August, which was fully up to the average. But the record for the last four months of the year is especially remarkable, being only 4.87 inches, or less than the average of the single month of October. Hence the present distressing lowness of the springs and general scarcity of water in our whole region, including Lake Cochituate. The average yearly fall of snow is given for only five years, omitting 1871.

Fourthly, the Direction of the Winds. — I can give this for the last five years only, presenting it approximately for eight points of the compass, — the yearly, not monthly results; observations thrice a day.

	N.	S.	E.	W.	N.E.	N.W.	S.E.	S.W.
1874	133	166	85	214	84	215	42	156
Average 5 years	130	109	96	236	84	225	44	174

It will be seen that the west and northwest winds greatly prevail, being nearly equal; next comes the southwest, then north, south, etc., while the southeast is least frequent, then northeast, east, etc.

If now we add together all the northerly winds, including north, northeast, and northwest, and also all the southerly in the same way, and subtract the one amount from the other, we learn that the northerly exceed the southerly by 68. Then add all the easterly and westerly winds in the same way, and subtract as before, and we find the westerly exceed the easterly by 374. That is, the average direction of the wind for 1874 was 68 north by 374 west. Let these two numbers represent the latitude and longitude, or two legs of a right angled triangle: by solving the problem, we have the direction approximately N. 79° 48′ W., or north more than seven points west. By adding these directions for the last five years together and dividing by five, we find the average for the five years to be N. 70° 53′ W. The extreme years were 1870, N. 55° 47′ W., and 1871, N. 82° 41′ W.

The direction of the winds varies greatly in different seasons of the year. During these five years the average winds of June, July, and August have been southerly by a balance of 13, 118, and 55 observations respectively, July having the strongest southern influence, as we might expect. The other nine months have all averaged northerly by a balance as follows: February 168, March 134, April 130, November 102, January 94, May 83, December 81, September 8, and October 1. By dividing these numbers by five, we have the yearly average. In the same way, we find the westerly winds greatly prevail over the easterly, being in excess nearly every month during the five years. The only exceptions have been in March, April, and May, 1870, in August, 1873, and in September, 1874, when the easterly excess was 2, 3, 28, 2, and 2 respectively; a mere trifle, except in May, 1870. The months with greatest westerly tendency are December 267, November 246, January 231, July 193; the least, May 74, September 96, June 111, and April 112.

A general map of the winds, giving the average direction and progress for each month, representing them by straight lines emanating from a primal point, is quite a curiosity. They resemble the rays of an open fan, though of course less regular. A still greater curiosity is a daily map of each month, giving the tri-daily changes. Sometimes a month will launch off in nearly one direction; again the wind returns upon itself, or takes almost every direction, and sometimes creates quite a snarl for a month, and perhaps ends very nearly where it began. I have no instrument to give the force of the wind.

Fifthly, Changes in the Barometer. — I must be brief here, having taken these observations only two years and only twice a day, at 7 A. M. and 9 P. M. No very satisfactory approximate can therefore be claimed. Yet a few things begin to appear, as general principles. The average height of the barometer for the year 1873 was 29.878 inches, with a range of 1.90 inches, between 28.70 and 30.60. In 1874 the yearly average was 29.939, with a range of 1.50, between 29.00 and 30.50. The average daily variations for the two years have been 0.20, and 0.1883 of an inch, but these differ greatly at different seasons. Dividing the year into three sections of four months each, the first section, beginning with January, gives a daily disturbance of 0.2757, the second division an average of only 0.0948, and the third of 0.2309; showing how much more calm and uniform the weight of the air is during the warm season than in the four opening or closing months of the year. The above numbers are for 1873, but are corroborated in general by the corresponding figures for 1874. The range for May, June, July, and August, 1873, was only .70, .60, .35, and .40, while in 1874 it was .90, .58, .37, and .53. But in February, March, November, and December, 1873, the range was 1.18, 1.38, 1.80, and 1.55; and in 1874, 1.00, 1.05, 1.43, and .87, same months. The more stormy and windy seasons are thus indicated in general by the wider range given to the barometer, and hence this instrument is considered useful in foreshadowing wind and storm, or more calm and fair weather.

It has been shown that the last year was a very warm one, being nearly two degrees above the average daily. One cause of this, though perhaps not a primary one, may have been the large amount of *southerly wind:* 364 observations, one third of the year, have been southerly, and 166 directly south, while the average has been only 109. The south wind brings heat.

Another peculiarity of the past year has been the very small amount of rain, only about 34 inches, instead of 47, the average of the five preceding years. As these observations are taken within the watershed, and in full view of Lake Cochituate, the case is one of marked interest, especially at the present time, while the lake and all our wells are so very low, filling with anxiety a large city dependent on its waters. The rain and snow fall is still exceedingly small, being only 2.27 inches up to the time of this writing, January 28, 1875. D. W.

NATICK, MASS.

EDITORIAL NOTES.

SCIENCE AND SENSE. — In an able article in the last number of the *Fortnightly Review*, Professor Clifford defines science as "organized common-sense." Another writer, in the *Pall Mall Gazette*, says, "I expressly use the word 'scientific' as equivalent to 'reasonable, intelligible, and consistent.' But if the use of the word science should turn out to be so liable to misapprehension as some appear to consider it, and if people are found to persist in thinking that one means something opposed to instead of identical with common-sense, I should be quite willing, as a matter of temporary convenience, to do without it." All sensible scientific men will endorse these definitions.

THEN AND NOW. — In looking over some old letters, we came across one from the late Horace Mann, in which, in response to an invitation to lecture before a lyceum, he remarks, "Perhaps you will not wish to have your invitation accepted when I inform you that I have raised my terms to *fifteen dollars.*" This was in 1849. A strange contrast indeed, as now lecturers of the second class demand one hundred dollars for their evening performances. They are mostly dear at any price.

THE LOWER AND THE HIGHER LIFE. — An eloquent inaugural address was delivered by Dr. William Stokes at the late annual meeting of the Royal Irish Academy. After reviewing the recent progress of science, he concluded as follows: —

"The conservation of energy, directive though not creative, in the living organized structure, and the chemical affinities in that which is unorganized, show, it might be held, that a lower mode of life pervades every existing being; but we believe that in God's own time that higher life which shows itself in progressive organization, and is terminable, will have a different existence, at least as regards the human being — one freed from material associations, freed from physical influences and from moral shortcomings. It is believed by thoughtful men that matter is indestructible. May we not find that as it has, in time, subserved the physical, so in eternity it will, when spiritualized, subserve the moral law, and thus an undying result will be evolved? It has been written that we 'see as through a glass, darkly;' but are there not grounds for the belief that such will not forever be the case? May we not believe that every discovery in development, in structure, in chemical composition, and in electrical and optical character, will be, when related to the property of life, a fuller ray of the burning lustre by which we approach the footstool of that throne where we shall be permitted nearer and nearer to contemplate the power and the ineffable light of Him from whom comes all life?"

OXYGEN IN HYDROGEN. — Hydrogen gas, whether prepared by electrolysis, or by the decomposition of water with the aid of zinc and sulphuric acid, contains an appreciable amount of oxygen. In fact, it would appear that it is almost impossible to free it entirely from this admixture, such is the eagerness with which hydrogen seizes upon oxygen, whether

atmospheric or contained in solution in water. No definite compound is formed, but simply a mechanical mixture, in which the properties of both constituents remain unmasked. Professor Grove first noticed this peculiar property of hydrogen while experimenting on the contraction sustained by different gases after ignition and subsequent cooling. He found that the contraction, in the case of hydrogen, sometimes amounted to one tenth of the original volume. He found, on examination, that this was due to the oxygen held in suspension by the hydrogen, and which the latter obtained by passing through water. A lump of phosphorus, placed in a vessel containing ordinary hydrogen, phosphoresces for a considerable time, thick fumes being simultaneously given off. If this hydrogen, thus deprived of the oxygen, be made to pass, ever so rapidly, into a receiver filled with water, it will have absorbed a sufficient amount of oxygen to cause a second piece of phosphorus to exhibit phosphorescence, and to give off its characteristic fumes, the hydrogen having in its brief passage through the water carried off all the dissolved oxygen.

He Wants to be a Shorthorn. — It is interesting to know from the English agricultural journals that "His Royal Highness the Prince of Wales has intimated his intention to honor the Shorthorn Society by becoming a life member."

ATOMS.

According to *Les Mondes*, paper treated with an ammonio-cupric solution and dried becomes impermeable to water, and preserves its consistency even in boiling water. — A few drops of sulphuric acid will prevent mould or putrefaction in solutions of gum-arabic. — Equal weights of white lead and red lead mixed are said to make a good cement for fastening glass to metal. — Böttger states that, after shaking an alcoholic solution of any aniline color with a sufficient quantity of infusorial earth, and then adding some water to the mixture and placing the whole upon a paper filter, the filtrate will be found to be perfectly colorless, the coloring matter being retained by the earth. — A new asteroid, the one hundred and fortieth in the list, was discovered by Professor J. C. Watson, of Michigan University, while in Peking, where he had charge of one of the parties sent out to observe the transit of Venus. — The extent of horticultural industry in Ghent may be inferred from the fact that there are as many as two hundred nurseries in and around that town, almost exclusively devoted to raising ornamental plants and the better sorts of fruit trees; the glass houses occupy an area of nearly eighteen acres, and in these houses from 2,705,000 to 3,542,000 plants are annually raised, to the value of from 5,930,000 to 7,705,000 francs. — In an address to the French Association of Sciences at Lyons, Colonel Lausedat, reviewing the work of that body, mentioned that M. Jacquemin had found that hypochlorite of soda with a drop of aniline was a good test for carbolic acid, immediately producing a blue salt, erythrophenate of soda. — The superintendent of the Calcutta Botanic Gardens states that the propagation of the ipecacuanha plant by root and leaf cuttings has been so successful that there is at present in the gardens a stock of 63,000 living plants; whereas four years ago there were but twelve cuttings, of which seven were afterwards accidentally destroyed. — At one of the meetings of the British Association at Belfast, Mr. Frank P. Fellows confuted as erroneous the idea that plants like ivy growing on the side of a house tended to make the walls damp; he said he knew a row of houses, the only dry one among which is covered with ivy. — In China a liquor is distilled from the flowers of the chrysanthemum which is regarded as an elixir vitæ, and in the Chinese pharmacopœia a powder of the flowers is prescribed as a cure for drunkenness. — M. Champion, who is excellent authority on the subject, says that in a single litre (a trifle less than a quart) of nitro-glycerine there is stored up the enormous force of 5500 horse-power acting continuously for ten hours. — To keep ice from windows, rub a little alcohol over the glass once or twice a day with an ordinary paint brush, or sponge. — A farmer in Kentucky has found a use for snakes; for two years he has had one shut up in his corn crib, and all that time not a single mouse has been seen there. — A very fine and intense chrome-green may be prepared, according to Casaria, by heating a mixture of equal parts of sulphur and bichromate of potash to redness in a crucible; the product is then to be lixiviated with hot water, which dissolves the sulphide and sulphate of potassium produced, and leaves the oxide of chromium as a fine powder of an intense green color. — According to recent calculations, English is spoken by 99,000,000 persons, German by 45,000,000, Spanish by 55,000,000, and French by 45,000,000. — An imitation ebony is made by soaking pear-wood in an iron and tanning dye-bath for a week or more; the color penetrates to the heart of the wood, so that the cut is as black as ebony. — As an illustration of the limitless number of combinations which the three primary colors are capable of, it may be interesting to know that in the Gobelin tapestry manufacture 28,000 distinct shadings of yarn are employed, each one distinguishable by the practised eye. — The opening numbers of the *New England Journal of Education* (which, by the way, is on our "Clubbing List") have been excellent, and the new weekly deserves the patronage of every teacher in New England. — Those who have read Curtis Guild's "Over the Ocean" (the most useful companion to the guide-book that the tourist can have) will be glad to know that he is now publishing a second series of foreign letters, under the title of "Abroad Again," in the *Commercial Bulletin*. — That capital educational monthly, *Home and School*, published by J. P. Morton & Co., Louisville, Ky., is cheap enough without premiums, but a good steel engraving (not a "chromo") is now given to each new subscriber. — A German engineer has founds that rails, soon after being laid on a railway track, always become converted into powerful magnets. — It is said by those who have tested it, that a strong decoction of the roots of *Podophyllum peltatum* (known variously as may-apple, mandrake, wild lemon, raccoon berry, etc.) will kill potato-bugs as quickly and as certainly as Paris green; also rose-bugs, currant-worms, and many other insects that are injurious to plants.

QUESTIONS AND ANSWERS.

McK. & Bro., Brookville, Pa. Small ice-houses do not keep ice as well as large ones, and there are some annoyances and difficulties to be met in the management of private ice-houses which render them not desirable when a supply of ice can be obtained from the dealers. Ice-houses should have a ventilating arrangement at the gable end, or upon the roof.

N. V. R., Galena, Ill. Thermometers indicate correctly the temperature of air, whether the wind blows or not, if they are good instruments. Air in motion is not colder than when at rest, but it is much more uncomfortable, and at low temperatures much more hazardous to encounter.

Dr. C. C. S., Bedford, Mich. Glue can be bleached to a considerable extent, but the best white glue is made from selected stock, and manipulated in a cleanly way to preserve its transparency.

D. S. M., Watertown, N. Y. We prefer to manure potatoes with mineral or artificial manures. It has been our experience that better tubers are obtained, and more of them. Plaster, superphosphate, and, above all, ashes, give the best results.

G. A. T., Armada, Mich. We have entered into correspondence with parties in Colorado respecting the beautiful myrtle-tree of that country. Our wish is to obtain some of them this spring for trial at the farm, and we will give our readers the results of our experience in their transportation and cultivation in the Northern States.

J. D., Grand Detour, Ill. Rubber boots can be mended by the use of the cement prepared from dissolved rubber, which is sold generally by dealers in cities.

J. C. C., San Francisco, Cal. The English, in making the celebrated "ginger ale," use glucose, to a considerable extent. It gives that round, full body to the beverage which is so much admired. We cannot give you a recipe.

L. S. T., Bordentown, N. J. Very frequently have we cautioned farmers against attempting to make superphosphate out of coarsely ground bones. It is a waste of time and material, and very discouraging to farmers. The bones, to dissolve well in acid, must be *finely ground*. If the bits are as large as peas, they will not dissolve, since a coating of insoluble sulphate of lime forms around them as the result of the first effects of the acid, and this stops further action. With fine bone meal all will go well.

M. B. L., Boston, Mass. No: Professor Dana of Yale is not a Darwinian, or he is not in full sympathy with Darwin's views. He says, "There is no question, *first*, that geological time has been of vast length; *second*, that there is an historical order in the rocks of the globe, and that the process of the world's creation may be, to a large extent, read in the rocks; and *third*, that there has been a system of progress in the earth's living species from the simpler forms of earlier time to man. But, while adopting these conclusions in common with all geologists, I have no faith in the Darwinian scheme of deriving man through gradual development upward from the monkey, or of evolving a system of life through 'natural selection' I deplore the misuse of science in the support of materialistic views, not uncommon among those who adopt the Darwinian hypothesis. At the same time I grieve, for the sake of the Bible and religion, that the discussions relating to scientific views and men should be so often interspersed with abusive epithets, and so often presented by those who are ignorant of the sciences they are attempting to set right."

Dr. S. P., Kalamazoo, Mich. The earliest mention of petroleum oil as an illuminator occurred in the *American Journal of Science* in the year 1826. An article in that periodical written by Dr. Hildreth, of Marietta, Ohio, spoke of it as "beginning to be in demand for lamps in work-shops and manufactories. It affords a clear, brisk light when burnt in this way." He adds the prediction, "It will be a valuable article for lighting the street lamps of the future cities of Ohio." It was thirty-five years before the fulfilment of the spirit of this remarkable prediction began to be realized.

O. A. N., Milford, Del. "A writer in the *News*, of this place, states that Indian meal is as good as guano, for a fertilizer. Is this correct?" Indian meal must of course contain all the elements of nutrition needed for its growth, and therefore it will by decay or decomposition restore to the soil that which it took out during its growth. It would be unsafe to use it in close connection with seeds, as the heat developed during its fermentation in the soil would destroy the germinal principle. We do not want in this section to employ meal to grow corn. It will be much more in accordance with good common-sense, to feed the meal to animals and get benefits from the grain in the milk-pail, and also in the manure heap.

Mrs. T. S., Salem, Mass. We have frequently been asked the same question: "Is the common table salt in use now as good as that formerly sold?" It is hardly possible that any one can find it to pecuniary advantage to adulterate so cheap an article as salt. We have never seen a specimen which had suffered from sophistication. If anything could be used as adulterants, it must be marble dust, or ground clam-shells. Salt is now much purer than that used formerly, and the bitter taste has to a great extent been removed.

H. G., New York. The heat produced in "slaking" lime is due to the intensity of the chemical action. The lime has a strong affinity for water, and unites with it to form a hydrate. Chemical combination is regularly attended with the evolution of heat. This is illustrated in our ordinary methods of obtaining heat by the burning of fuel, which is simply a process of oxidation. If a piece of iron is ignited in a jar of oxygen gas, it burns quickly with a great heat. If the same piece of iron is allowed to rust away in the air, it is none the less burned, though slowly; and the whole amount of heat produced is precisely the same as in its quick combustion in oxygen gas.

J. P., Boston. Gas and naphtha stoves vitiate the air of rooms unless a pipe or flue is provided for carrying off the products of combustion. It would be imprudent for a person suffering from "slow consumption" to spend the greater part of the day in a room heated by such a stove. Indeed, no person, sick or well, ought to do it. One would not think of having a coal stove without a pipe to carry off the gases produced by the combustion; but many people suppose that a gas stove needs nothing of the kind. It is true that we usually burn gas for illuminating purposes without a means of escape for the invisible products of the burning; but it is none the less true that the air is vitiated by those products just as it is by our breathing. Where many burners are used, as where many persons are breathing, the air will soon become impure, unless means of ventilation are provided.

G. H. H., Salem, Mass. A foreign authority says that alcoholic varnish can be made to adhere more firmly to polished metallic surfaces by adding one part of pure crystallized boracic acid to two hundred parts of varnish. "Thus prepared it adheres so firmly to the metal that it cannot be scratched off with the finger-nail; it appears, in fact, like a glaze."

Your other question is not exactly in our line, though music is one of the natural sciences as well as one of the fine arts. Richardson's "New Method for the Pianoforte," we may, however, commend as the best instruction-book for that instrument.

It is published by Ditson & Co., and its merit is attested by the fact that more than a quarter of a million copies have been sold. It is indorsed by the most competent critics, and used by our ablest teachers.

J. A. S., Dorchester, Mass. The heliotype process is described on page 13 of Volume VIII. of the Journal (August, 1873). It may be seen in its actual working at J. R Osgood & Co.'s, Franklin Street, Boston.

LITERARY NOTES.

The Appletons have just reprinted *A Compendium of Children's Diseases*, by Dr. J. Steiner, of Prague, translated by Dr. L. Tait, which will be found a valuable guide for the student and the practitioner. The work has met with such marked success in Germany that a second edition has been called for, on which this English edition is based. The translator has added as an Appendix the "Rules for Management of Infants" prepared for the Birmingham Children's Hospital, and also some notes on the surgical ailments of children.

The same house issue in neat pamphlet form Tyndall's *Address before the British Association*, as revised by the author, with a preface replying to his critics, and an appendix containing the address on "Scientific Materialism" delivered in 1868.

Two other noteworthy reprints of the Appletons are Greville's *Journal of the Reigns of George IV. and William IV.*, and the first volume of Theodore Martin's *Life of the Prince Consort*, a pair of books which *Punch* has aptly described as "the bane and the antidote." History, as formally written, is a drama which we view as put upon the stage; books like these take us behind the scenes and show us the actors as the men and women they really are. The latter class of works forms a supplement to the former, as instructive as it is curious and entertaining, and one which the student of history will reckon indispensable. This edition of Greville's book, by the way, is the only complete and unabridged one published in this country.

A *Manual of Determinative Mineralogy*, with an Introduction on Blowpipe Analysis, by Prof. G. A. Brush, of New Haven, has just been published by Messrs. J. Wiley and Son, of New York. In an unprinted form it has long served as the basis of lectures and practical exercises in the laboratory of the Sheffield Scientific School. The "Tables for the Determination of Minerals" are based on the tenth German edition of Von Kobell, with additions and important improvements in arrangement. On the blowpipe analysis, the third and fourth editions of Plattner have been chiefly consulted. The work is in the main thoroughly and ably done. The publishers have done their part in unexceptionable style.

Messrs. G. P. Putnam's Sons publish a translation of a monograph on *The Treatment of Nervous Diseases by Electricity*, by Dr. Fieber of Vienna. It is a thin duodecimo, but it gives all the information on the subject which the general practitioner needs. It gives in a nutshell, so to speak, the results of the many thousand cases treated by the eminent author.

Messrs. J. P. Morton & Co., of Louisville, Ky., are now the publishers of Prof. G. F. Barker's *Chemistry*, which is one of the best works of its grade, and has been widely adopted as a college text-book. Among their latest issues is Butler's *Practical and Critical English Grammar*, which has some special merits as a manual for the most advanced classes. It is particularly rich in illustrative examples, selected from standard English literature. Teachers will find it valuable for purposes of reference, even if they do not adopt it as a text-book.

A good concise handbook of mythology has been a desideratum. The demand is well met in Murray's *Manual of Mythology*, reprinted by Scribner, Armstrong, & Co., from the second revised English edition. Besides the Greek and Roman myths, it includes the Norse and old German, the Hindu and the Egyptian, all of which are treated with sufficient fulness for school use, and for general reference. The illustrations from the antique are remarkably good, considering the low price of the book.

A *Grammar School Geography* has been added to Guyot's popular series, and seems to be just suited to the wants of that grade of schools. It has an unusual number of well executed maps, which is a commendable feature.

The first edition of *Parnassus*, the collection of poetry made by Ralph Waldo Emerson, and published by Osgood & Co., was snapped up at once, and a second has been issued with some corrections and improvements. There are still errors in the book; for instance, one in each line of Berkeley's famous stanza, "Westward the course" (not "star") "of empire takes its way." The new edition of Tennyson, from the same publishers, contains the author's latest revision of his poems. It is interesting to compare it with the early editions, and to note the many changes that have been made

Harper's School Histories of the United States (edited by Scott) deserve a high place among the scores of similar books in the market. They are well written, and the maps and illustrations are excellent, as the imprint of the Harpers sufficiently attests. The smaller history is not, as in most cases, an abridged form of the larger one, but, as it ought to be, an independent work. Teachers in search of a text-book should examine them.

The National Bureau of Education has recently sent out two interesting pamphlets: *A Statement of the Theory of Education in the United States*; and *The National Bureau of Education: Its History, Work, and Limitations*. Considering the "limitations," the "work" done is highly creditable.

Medicine and Pharmacy.

DISEASE IN THE TEAPOT.

Though a temperate indulgence in the Chinese herb that "cheers but not inebriates" is admitted to be harmless, except by a few dietetic extremists, its immoderate use is deemed injurious, if not dangerous, by all the best authorities. The teacup may prove toxical, though not intoxicating. There 's "death in the pot" for those who imbibe its potent infusion too freely. A warning cry comes to us from the antipodes, where intemperance in tea-drinking is said to be alarmingly prevalent. Dr. Knaggs, of Newcastle, New South Wales, who has made a special study of cases of "tea poisoning," lifts up his voice against the growing evil. The symptoms of such cases he states thus: "Mental excitement; præcordial distress; acute pain and spasms in the region of the heart; sensation of faintness; an anxiety and feeling of approaching death; pulse irregular, feeble, and intermitting; irregular and oppressive respiration, almost approaching asphyxia every five or six minutes." The full series is to be found, of course, only in extreme cases, but portions of the unpleasant list are met with frequently in the physician's practice. Many disorders of the nervous system are the direct result of excessive tea-bibbing. Tea is a "neurotic poison;" its essential principle, theine, is allied in composition and properties with strychnine and morphine. It first excites the nervous system, and then exhausts it. Experiments show that, both in man and in other animals, it impairs power in the lower extremities; so that it affects the "understanding" in a double sense — literally as well as figuratively. It is not the harmless exhilarant it has been considered, but a powerful agent whose effects are often serious. The manifestations of energy it evokes by its stimulating properties are, as Dr. Knaggs remarks, "at the expense of the total of life;" which expenditure, as it is not a food, it does not replace. As he goes on to say, —

"The excitement of the brain produces an artificial and evanescent energy, which for a time stimulates to action and creates a false feeling of strength. Thus are the victims of tea excess deprived of stamina such as would be supplied by nourishing food; at the same time a mental excitement, mistaken for energy, incites them onward; with body weak but spirit willing, they pursue an unequal fight in their battle of life; the very stimulant which urges them onward in the strife deprives them of the bodily strength necessary for carrying on the fight. Like many — too many — followers of an *ignis fatuus*, the time comes when they find themselves hopelessly involved in the mire; their bodies wasted, nerves shattered, strength gone, energy departed, health impaired, and the battle lost!"

The London *Sanitary Record*, to which we are indebted for this quotation from Dr. Knaggs, comments upon it as follows: —

"This is a picture which is somewhat appalling, and which destroys the comfortable confidence too often reposed in tea; indeed, it shows that, like other agents acting upon the nervous system, tea in small doses may be a useful and harmless beverage, but in large and repeated doses it is scarcely less pernicious than alcohol and tobacco. It is among poor women especially that the evil effects of excessive consumption of tea are most seen in this country; in these persons the nervous system is unstrung and often even shattered. To such an extent does this tea poisoning extend that the time is near at hand when tea will take its place alongside alcohol and tobacco as stimulants whose evil effects, when indulged in to excess, are much to be deplored."

Intemperance in the use of tea is probably not so common in this country as in England, where the temptation to resort to it as a means of eking out a "starvation diet" is more frequent; but the warning is nevertheless needed here, especially in New England, which takes much more than its fair share of the fifty million pounds of tea annually steeped in the national teapot.

TINCTURE OF ARNICA POISONOUS TO THE SKIN.

One of the most popular articles in the household materia medica is tincture of arnica. It is used in almost every family in the land as an external application for sprains, bruises, and pains generally. But according to Dr. J. C. White, it often exerts a poisonous action on the skin. In the *Boston Medical and Surgical Journal* for January 21, 1875, he describes in detail three cases in which it produced acute inflammation, or eczema. Arnica, he says, "must therefore be regarded as an irritant poison when applied to the skin of some persons." Even when it is not hurtful he believes it to be useless for the purposes for which it is employed. "Its properties reside in an acrid resin and volatile oil." For its reputation as an application for sprains and bruises, "it may thank the alcohol associated with it, for this, beyond doubt, is the only active agent in such application."

When arnica is used so extensively, why are not cases of poisoning by it more common? To this question Dr. White replies: —

"I believe that they do occur not infrequently, but that they are not recognized. The appearances which follow its use are no doubt often mistaken for the immediate effect, or the sequelæ, of the injury or other trouble for which it was applied. Even the physician, there can be little doubt, often fails to recognize the artificial nature of the eczema he is called to treat, and to connect it with the prior application of arnica to the skin. The almost universal belief in its harmlessness, too, would prevent in most cases the patient from communicating to the physician the fact of its use before the appearance of the disease. It is not to be wondered at, however, that physicians are so little acquainted with these poisonous properties, when we see how little mention is made of them in medical literature. The works on materia medica that I have at hand give it a more or less feeble commendation, but make no allusion to its injurious action upon the skin. Very few of the works on toxicology place arnica among the poisons, and Van Hasselt, who gives the fullest account of its injurious properties when administered internally, says nothing of its action upon the skin. Neither do I recall any reports in medical journals of cases of such affection. In works on dermatology, even, scarcely any mention is made of the subject. In a long list of substances enumerated as capable of producing eczema, in his chapter on this disease, Hebra includes arnica without special mention; but in his article on erythema nodosum he says: 'Some medical men, however, suppose that the tincture of arnica is a perfectly harmless remedy in erythema nodosum, and in similar affections. But I would give a friendly warning to those who advocate its use; unless, indeed, they propose to employ it homœopathically and in infinitesimal doses. In the proportion of a drop of the tincture to a pail of water, this substance may certainly be applied without any risk of doing harm. But I have in practice had abundant

occasion to observe that the tincture of arnica, even when much diluted, acts most injuriously upon the skin of some persons. I have frequently seen eczema or dermatitis excited by the assiduous application of lotions containing this drug, in the treatment of slight bruises or sprains.' Fox, in his brief remarks on medicinal rashes, says: 'Arnica may produce erythema and swelling of the part to which it is applied, or it may excite a real eczema.'"

These facts ought certainly to be known by physicians and by everybody who has been in the habit of using this popular tincture. The extent to which it is used may be inferred from the fact that there are single houses in Boston that sell several thousand pounds of arnica flowers every year. The herb is employed in veterinary practice, but full one half of all that is sold goes to supply the demand for the tincture as a household "pain-killer." The alcohol without the poison would be cheaper as well as safer.

THE TESTING OF OILS.

A SIMPLE method of testing oils is a desideratum in pharmaceutical chemistry. A lady contributor to the *Journal of Pharmacy* describes some original experiments in which the "cohesion figures" produced by dropping oils on the surface of clean water are utilized for this purpose. Even if the process should not prove to be of so much practical value as she expects, it is curious and interesting in itself, and we have no doubt that many of the readers of the JOURNAL will enjoy repeating the experiments, a brief abstract of which we will give. A single drop of oil was allowed to fall from a burette held at a distance of four inches from the surface of a dish of clean water. The time required for the production of certain figures was carefully noted, as it appears that several oils will produce very similar figures ultimately, if sufficient time be given. Oil of turpentine spreads out instantly and begins intestine motions, and lastly forms a beautiful lace-work. Oil of cinnamon forms a figure not more than half the size of the above. In a few seconds, small portions are detached, and separate into distinct drops. Oil of nutmeg forms a large figure instantly, the edge showing a beaded line. Poppy-seed oil spreads instantly to a large figure, retaining an unbroken form for a few seconds, then holes appear round the edge, and soon the whole surface is broken up with curved lines. Cod-liver oil spreads into a large film; a little way from the edge small holes appear, and in a minute or two the surface is studded with them. These gradually enlarge, assume irregular shapes, and become separated by branching lines. As these oils give different figures, and behave differently when mixed with one another, or with lard oil, the method may afford a means of detecting adulterations. At any rate, it is well worth trying.

THE USE AND ABUSE OF THE TOOTH-BRUSH.

IT is generally assumed that the tooth-brush cannot be used too frequently or too vigorously, but Dr. Foster Flagg, of Philadelphia, in an article on "Dental Pathology," in the *Dental Cosmos*, takes the ground that this toilet instrument may become the means of causing the very evils it is intended to avert. He has found in the course of a long professional practice many sets of teeth in excellent condition, which the owners assured him were never brushed, but cleansed only by a good rinsing after meals; while, on the other hand, he has met with many cases of disordered and decaying "dentures" which had been "thoroughly brushed five times daily for many years, and with the best and stiffest brushes that could be obtained." From these and kindred facts he has come to the conclusion that, though the judicious use of proper brushes is well for the teeth, the way in which they are generally employed is likely to do more harm than good. The following practical suggestions we will give in Dr. Flagg's own words: —

The brush should be selected for its moderate softness, and by no means for its stiffness; it should have rounded edges, both of bristles and of handle, that neither may wound the gums; the length of time for each brushing of the teeth should never exceed from ten to twenty seconds (by the watch); the water used should never be so cold as to cause the least uneasiness to the teeth, and the articulating faces of the teeth should be even more carefully brushed than the labial or buccal. Twice or at most thrice brushing, daily, is as often as any denture will permit, and great caution in regard to brushing the gums from off the necks and even roots of the teeth will have to be exercised if more than one brushing daily is indulged in.

With regard to tooth-powders, Dr. Flagg condemns all those containing insoluble ingredients, such as ground barks and especially pulverized charcoal, as useless for preventing decay, while they cause serious injury by getting under the edge of the gums. Soap, which we have before recommended as an adjunct to all dentifrices, he approves; as well as certain antiseptics, like carbolic acid, "which, conjoined to saponaceous compounds, have wrought wonders in retarding and even arresting caries." With the soap it is advisable to use some frictional powder, such as precipitated chalk, if that suffices to prevent discoloration, or powdered cuttle-fish bone. Even finely pulverized or levigated pumice-stone may be employed without injury to the enamel, Dr. Flagg believes, many of his patients having tried it for years with no bad results.

The following hints will be found useful in many cases: —

When, from testing the contents of cavities of decay and the fluids of the mouth with litmus paper, an acid condition is pronounced, great benefit will be derived from the addition of a few drops of ammonia, or a grain or two of bicarbonate of soda, to the water used for brushing the teeth, or lime water may be easily made by pulverizing a piece of quicklime about the size of a walnut, and putting it into a pint bottle; add to it water, shake, allow it to settle, and it is ready for use. When nearly used, fill the bottle again with water, and with the same treatment as before it is again ready. Thus lime water for a life-time may easily be had.

If more than this seems indicated, I next add to the above the directions for the topical employment of precipitated chalk. This it is most advantageous to use at night, just before going to bed. It is to be used in small quantity by dipping the end of a finger into the chalk, and thus conveying from three to five grains of the powder to the interstices of the lower buccal teeth.

It is then gently rubbed into these and allowed to remain: so little as to be unnoticed by the senses of touch and taste, and yet enough to do great good in the desired direction.

With ordinary care, and particularly with the use of soap, the morning brushing destroys most of the power for harm pertaining to all the putrescing food and mucus, and all the fungiferous growth of the previous night; the mastication and concomitant outpouring of saliva at the morning meal completes the work of protection for the time, and although the remaining food which is left in cavities, crevices, and interstices would in time become productive of caries, yet the allowed time is insufficient for the accomplishment of much injury before the mastication and insalivation of the noontide food repeats the dislodgment of the spoiling remains, and thus again protects the denture; again, at the evening meal the same result ensues, to which is frequently added that brushing of the teeth which forms part of the preparation for the evening. Thus it is that the teeth pass through the day and early part of the night without much progress of caries; but after retiring, the remaining particles of acidifying food, the inspissating mucus, the developing fungi, all combine to make the hours toward morning preëminently the period of decay. Then it is that the chalk placed between the teeth late at night, and allowed to remain there, comes to the rescue, and by its antacid reaction prevents, in great degree, both disintegration dependent upon acidity and parasitic growth.

CARBOLIC ACID AS A CURE-ALL.

WE have a high opinion of the value of carbolic acid as a disinfectant and as a therapeutical agent in many cases, but we can hardly go so far as Dr. Déclat, of Paris, who has lately issued a book entitled, "Traité de l'Acide Phénique appliqué à la Médecine." He makes carbolic acid a panacea for all diseases, cancer not excepted. A correspondent of the London *Medical Times and Gazette* comments on the book as follows: —

Dr. Déclat's doctrine is to the effect that all diseases are due to the development, *in* or *on* the body of man and animals, of animalcules that are microscopic or visible to the naked eye, — that is, parasites, — bearing an absolute resemblance to the ferments that disorganize organic matter. This theory as applied to certain diseases is founded on direct observation; to others, on striking analogies, and on all the other medical doctrines that have remained unexplained save by the parasitic theory. Parasitism explains contagion, miasmatic influence, the action of viruses, etc. The ferment germs, floating in the air or placed in contact, in certain conditions, with our organism, are developed in it and alter its functions. Epidemic diseases are due to the invasion of animalcules wide-spread in the atmosphere, like the myriads of inoffensive flies which, in the spring of 1872, so infested Paris, or like the clouds of locusts which are sometimes observed in Algeria. Endemic diseases, intermittent fevers, yellow fever, typhoid fever, etc., are to be traced to centres of putrid fermentation, from which they derive their living germs, the parasites, which are unanimously acknowledged by scientific men to be the cause of these affections. As for sporadic maladies, these do not prevail equally as regards time, place, and seasons; and the proof that they also are of parasitic origin is, that many animals and vegetables are generated and developed at certain determined periods and places. This theory being admitted, the period of incubation, which precedes the appearance of disease, may be thus explained: as the germ or morbific ferment introduced into the system requires a certain time to reach the active phasis of its existence, so the duration of the stage of incubation varies according to the species to which the parasite belongs. In the same way is the duration of the incubation of the eggs of different oviparous animals variable. Moreover, the development that follows incubation is more or less rapid; hence we have acute and chronic affections.

Such is, in substance, Dr. Déclat's theory of the origin of disease, which in many respects is unassailable; but where he errs is in imputing every disease to parasitism. . . . According to Dr. Déclat, the practice of the healing art would be reduced to its simplest expression if medical men would only bear in mind that, the fermentation of organized matter being due to germs floating in the air, two indications naturally present themselves to oppose to these agents of disorganization or decomposition. 1. To prevent the fermentable substances from being in contact with the air; and on this is founded the conservation of alimentary substances. 2. To destroy the ferments existing in the atmospheric air or absorbed into the organism. This Dr. Déclat proposes to do by the free use of carbolic acid internally as well as externally; and he is so imbued with the rationality of his doctrine, that he has started a journal, entitled *La Médecine des Ferments*, which, as is naturally to be expected, is full of carbolic acid and its various forms and preparations.

PROCESS FOR OBTAINING THE ALKALOID, EUPATORINE.

[With the following communication we received specimens of the crude and purified eupatorine, for which the author will accept our thanks.]

To a strong decoction of the *Eupatorium perfoliatum* is added an excess of a clear solution of lime, which precipitates the impure alkaloid as a green powder. This is washed with cold water, and dissolved in an excess of oxalic acid solution. It is now boiled with animal charcoal, filtered through cotton while warm, and the alkaloid precipitated with ammonia; again washed with cold water, and lastly evaporated.

Eupatorine is insoluble in cold water, but is dissolved slightly by boiling water. It dissolves readily in acids, especially hydrochloric, from which it is again precipitated by an alkali. It will bear a moderately high temperature without being decomposed.

R. B. W.

DIPSOMANIA.

Some extraordinary instances of the insatiate desire, or rather morbid impulse, to drink are mentioned by Dr. George Burr, in a recent paper on the "Insanity of Inebriety." Dr. Bush records a case of an habitual drunkard in Philadelphia, who, when strongly urged by one of his friends to leave off drinking, replied, "Were a keg of rum in one corner of a room, and were a cannon constantly discharging balls between me and it, I could not refrain from passing before that cannon in order to get at the rum." One of the cases described by McNish, in his "Anatomy of Drunkenness," also illustrates this feature. A friend of the subject of it painted to him the distresses of his family, the loss of his business and character, and the ruin of his health, to which he replied, "My good friend, your remarks are just; they are indeed too true; but I can no longer resist temptation. If a bottle of brandy stood at one hand, and the pit of hell yawned at the other, and I were convinced that I would be pushed in as sure as I took one glass, I could not refrain." The late Professor R. D. Mussey, of Cincinnati, relates another case: "A few years ago a tippler was put into an almshouse in this State. Within a few days he had devised various expedients to procure rum, but failed. At length, however, he hit upon one which was successful. He went into the wood-yard of the establishment, placed one hand upon the block, and, with an axe in the other, struck it off at a single blow. With the stump raised and streaming, he ran into the house and cried, 'Get some rum! get some rum! my hand is off.' In the confusion and bustle of the occasion a bowl of rum was brought, into which he plunged the bleeding member of his body, then, raising the bowl to his mouth drank freely, and exultingly exclaimed, 'Now I am satisfied!'" Dr. J. E. Turner relates a case of a gentleman who, while under treatment for inebriety, during four weeks secretly drank the alcohol from six jars containing morbid specimens. On asking him why he had committed this loathsome act he replied, "Sir, it is as impossible for me to control this diseased appetite as it is for me to control the pulsations of my heart."

BREVITIES.

Scarlet Fever by Mail. — Mr. W. J. Land, of Exmouth, England, writes to the *Lancet* as follows: "As a small contribution to the correspondence now going on in your columns on the subject of scarlatina, I send you this, as showing how it may be transmitted from one part of the kingdom to another. In the spring of last year I received a newspaper from Inverness containing the announcement of the death of a friend's child. About a week afterwards the first symptoms of scarlatina showed themselves, and I suffered a mild (second) attack of the disease. There being no other case either in my own practice or in that of all the neighboring practitioners at the time, I was rather puzzled to account for it. Within the last few days I have heard that my friend's child's death was caused by a most malignant attack of scarlet fever (the attendant ordering burial the next day) which infected nearly all the rest of the household."

Whipping Girls in English Schools. — Some time ago we gave facts to show that the whipping of girls, or young ladies rather, was no unusual thing in first-class English schools. Within the last two months there appeared in a leading London daily an advertisement purporting to be from a lady who desired to place her grown-up daughters in a good school where they could have "severe birching discipline." This was probably a device for getting information as to the prevalence of this kind of discipline in the schools, for the following appears in a later number of the same journal: —

"The lady who advertised for 'severe birching discipline' for her grown-up daughters hopes that the 1019 ladies who offered to administer it will accept this acknowledgment, and that the 950 of them who 'habitually use the birch rod' will accept her special thanks."

The Action of Flour on the Teeth. — The *London Medical Record*, of February 3, commenting upon Dr. Cutter's article on this subject in the Journal, says: "It has long been noted in this country that in those districts where the use of oatmeal (in place of wheaten flour) prevails, we find children and adults with the best developed teeth and jaws; and so well recognized is the influence of oatmeal-diet upon the teeth, that many practitioners order its use as an article of daily diet for children, in cases where the dentition seems likely to be either retarded or imperfect."

SELECT FORMULÆ.

Transparent Pomade. — The following is a French recipe: —

Spermaceti	2 oz.
Castor oil	5 oz.
Alcohol	5 oz.
Oil of bergamot	½ drm.
Oil of Portugal	½ drm.

Melt together the spermaceti and castor oil, pour in the alcohol gradually, stop the heat, and add the perfume. Stir well, and pour into glass jars.

For Chilblains. — A correspondent of the London *Lancet* recommends a solution of sulphate of copper (4 grains to the ounce) as an application for chilblains. He has found that to succeed when everything else has failed to effect a cure.

Remedy for Colds. — According to the same French authority, powdered camphor, sprinkled with tincture of iodine, and inhaled by the nostrils, constitutes one of the most prompt and certain remedies for coryza, or "cold in the head."

"WAYS THAT ARE (NOT) DARK."

Men of perverted moral principles are often cowards. This proves to be the case with the Chicago druggist. After the overwhelming evidence of the falsity of his statements respecting the nature of Cincho-Quinine, as furnished by the testimony of six of the best analytical chemists in the United States, he was given every opportunity to make the *amende honorable* by acknowledging his errors; but instead of this he retreats behind the assertion that the composition of the agent has been changed since his extraordinary analytical labors with it came to an end. As soon as the manufacturers learned of this new "trick" of this man of "tricks," steps were at once taken to cut off his retreat in that direction. Specimens of the agent were ascertained to be in the hands of dealers in the Western cities, which they purchased prior to 1873, and these were sent to eminent chemists for analysis directly by the dealers themselves, and the following statements show the results: —

Massachusetts State Assayer's Office, 114 State St., Boston, *January* 22, 1875.

Messrs. Billings, Clapp, & Co.:

Gentlemen, — I have received two phials of Cincho-Quinine per Merchants' Express from Waterloo, Iowa, one of which has been subjected to analysis, and I find it to contain quinia, quinidia, cinchonidia, cinchonia. This phial afforded conclusive evidence that it had not been opened since it left the laboratory in 1872. The seal was unbroken, and the letters on the wax exactly corresponded with those on the cap. S. P. Sharples.

Professor Sharples was directed to seal up the contents of this package and send it to Dr. Genth, of the University of Pennsylvania, who writes as follows: —

Chemical Laboratory of the University of Pennsylvania, West Philadelphia, *January* 29, 1875.

Messrs. Billings, Clapp, & Co.:

Gentlemen, — I have received by express a package marked, "Sealed by S. P. Sharples, January 22, 1875," and containing a bottle of Cincho-Quinine with the label of James R. Nichols & Co., chemists, Boston, which I have tested, and have found it to contain *quinine*, *quinidine*, *cinchonine*, and *cinchonidine*. F. A. Genth.

The following is further testimony on the subject: —

Laboratory of the University of Chicago, Chicago, *February* 1, 1875.

I hereby certify that I have made a chemical examination of the contents of a bottle of Cincho-Quinine, and by direction I made a qualitative examination for *quinine*, *quinidine*, and *cinchonine*, and hereby certify that I found these alkaloids in Cincho-Quinine. C. Gilbert Wheeler,
Professor of Chemistry.

Professor Chandler, of the School of Mines of New York City, has examined Cincho-Quinine for quinine, and fully corroborates the results of the above eminent chemists as to the presence of that alkaloid.

The author of the libels under notice will find himself in trouble whichever way he attempts to retreat, and will learn a lesson which it would have been better for him to have learned before he made his venture at Louisville, last August.

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AMONG THE CLOUDS.

IN an article on "Our Water Atmosphere" in the JOURNAL for October, 1874, we briefly described the formation of clouds, and explained how they are suspended in the air. The classification of clouds our limits forbade us to consider at that time, but we intimated that we might make it the subject of another article. As the description of the various forms that clouds assume would hardly be intelligible without an illustration, we have had an engraving prepared to show them.

At first thought, it would seem that clouds present such an endless variety of shapes as to defy any attempt at classification, but a careful study of their ever-changing forms enables us to refer them to seven types: three simple, the *cirrus*, the *cumulus*, and the *stratus;* and four intermediate or compound, the *cirro-cumulus*, the *cirro-stratus*, the *cumulo-stratus*, and the *cumulo-cirro-stratus* or *nimbus*. With the exception of the last, they appear in the engraving, the cirrus being marked by one bird, the cirro-cumulus by two, the cirro-stratus by three, the cumulus by four, the cumulo-stratus by five, and the stratus by six.

The *cirrus* is the *curl* cloud, for that is the translation of its Latin name, and well describes all the varied and fantastic forms it takes. It is made up of parallel, wavy, or divergent fibres, which may increase in any or in all directions. It is the lightest of clouds and floats the highest. It is the first cloud to appear after a period of clear weather, its delicate filaments stretching across the blue sky in penciled lines of white. In fair weather, indeed, the sky is seldom entirely free from patches of it. Sometimes its waving fibres look much like the tail of a horse; sometimes they are interwoven into a veil of exquisite lacework. Light and airy as it appears, it is probable that this cloud is composed of minute crystals of ice or snow-flakes. In the elevated regions of the atmosphere where it floats, — full three miles above the earth, — the temperature is below the freezing point even in midsummer.

The *cumulus* is the *heap* cloud, and its name, like that of the cirrus, exactly describes its appearance. Its huge, rounded masses, piled up like great snow-drifts against the azure background of the sky, are doubtless familiar to every reader. It is a cloud of dense structure, and forms and floats in the lower regions of the atmosphere. It has well been called "the cloud of day," being caused by the currents of moist, warm air that rise from the heated earth. It begins as the little cloud not bigger than a man's hand, but grows into towering heaps of dazzling white, sometimes of mountainous grandeur. This is especially the case in tropical regions, where it often looks like mountains piled upon mountains in stupendous masses, such as we never see in these northern latitudes.

When cumulus clouds are of moderate height and size, have a well-rounded outline, and appear only during the heat of the day, they indicate a continuance of fair weather; but when they grow rapidly, sink down into the lower regions of the atmosphere, and do not disappear towards evening, rain may be expected.

The *stratus*, as its name implies, is a *layer* or long, continuous sheet of cloud. It is the lowest of the clouds, sometimes descending even to the surface of the earth. It has been called "the cloud of night," since it generally forms about sunset, grows denser during the night, and disappears with the returning day. It is caused by the vapors that rise during the day, but descend at evening with the falling temperature.

When the morning sun shines on the upper surface of the stratus cloud, it begins to heave up here and there into the rounded forms of the cumulus, and the whole lower surface begins to rise from the ground. As the heat increases, it continues to ascend, breaks up into detached masses, and soon disappears. This indicates a continuance of fine weather.

The *cirro-cumulus* cloud is composed of well-defined, small, roundish masses, lying near each other, and quite separated by intervals of sky. It is formed from the cirrus cloud, the fibres of which break, and gather into these small masses. It is commonly known among sailors as a "mackerel sky."

The *cirro-stratus* partakes of the characteristics of the cirrus and stratus, being made up of long, thin, horizontal clouds, with undulated edges, and either separate or in groups. It is a marked precursor of storms.

The *cumulo-stratus* is formed by the blending of the cirro-stratus with the cumulus. It is formed when the cumulus becomes surrounded with small fleecy clouds just before rain begins to fall, and also on the approach of thunder-storms. What are popularly known as "thunder-heads" belong to this type of clouds.

The *cumulo-cirro-stratus*, or *nimbus*, is the well-known *rain-cloud*, consisting of a cloud, or mass of clouds, from which rain is falling. Its name suggests the way in which it is generally formed. At a considerable height a sheet of cirro-stratus cloud is spread out, under which cumulus clouds drift from the windward; these rapidly increase and unite, forming one continuous gray mass, from which the rain falls. The breaking-up of the lower gray mass indicates that the rain will soon cease. When a rain-cloud is seen approaching at a distance, *cirri* appear to shoot out from its top in all directions; and the more copious the rainfall, the greater is the number of these cirri.

Some meteorologists do not recognize the nimbus as a distinct type of cloud, but consider it merely a form of the stratus.

The height of clouds above the earth varies greatly, as is evident from facts incidentally mentioned above. The cirrus is never seen below the summit of Mont Blanc (15,744 feet, or about three miles high) though some authorities assert that it may sink as low as 10,000 feet, and possibly even to 3000 feet. On the other hand, it has been seen above the top of Chimborazo (21,424 feet), and by aeronauts considerably above 23,000 feet. The range of the cumulus is probably from 3000 feet up to 10,000 or 12,000; and that of the stratus and nimbus from a few hundred feet up to 5000. The average thickness of cloud strata is from 2500 to 3000 feet, but this is greatly exceeded by some of the enormous piles of cumulus to which we have referred. These are mountains in height, as they are in form and semblance, their tops being sometimes four miles above the earth while their bases are within half a mile of its surface.

There are many other curious and interesting facts about clouds, a mere outline of which would fill another article like this. We may revert to the subject hereafter, but for the present we will close like the preacher, with a "practical remark." Though he that idly "regardeth the clouds shall not reap," he that never lifts his eyes to behold them loses much of nature's rarest loveliness and grandeur. He "sees not the bright light which is in the clouds;" and those clouds, as the same sacred writer has said, are "the wondrous works of Him which is perfect in knowledge." The glowing splendors of a fine sunset can hardly fail to catch the most careless eye, but there are thousands who have never observed the feathery lines of pure white traced by the cirrus overhead, or the subtly woven lace with which it drapes the azure dome. Some of the loveliest forms of cloud scenery are these which the great majority of men never see at all. He who seeks "among the clouds" for illustrations of the facts given in this familiar paper will find far more to repay his study than he anticipates.

FORCE: ITS PHASES AND PHENOMENA.

It has long been an accepted doctrine among thinking men that matter is indestructible. There is not a single grain of matter in the universe to-day more or less than there was at the creation. It may have changed its form millions of times, repeating again and again the circle of solids, liquids, and gases; of mineral, vegetable, and animal substance. It may at one moment have formed part of the purest and most delicate organism; at another, of the foulest and most offensive matter that contaminates the earth with its loathsome presence. A pound of wood loses none of its matter by burning; it is only changed to ashes and gases which, if collected, would weigh just as much as did the wood at the beginning; and, like the fabled Phœnix, it may in due time reappear from its own ashes. The coal dug from the mines of Pennsylvania is only the solidified gases and vapors that pervaded the atmosphere ages ago.

What has long been held as truth regarding *matter* is now as positively affirmed in respect to *force*. Force can no more be annihilated or created by human agency than matter. When it ceases to exist in one form, it assumes other forms which represent the original force undiminished.

The forms of force which most naturally suggest themselves are heat, light, electricity, magnetism, chemical action, and gravitation. All these manifest themselves sooner or later in motion, and this motion represents their amount and intensity as accurately as a gold coin represents the value of commodities in trade.

That a blacksmith may produce great heat, rising even to redness, by hammering a piece of cold iron on a cold anvil with a cold hammer; that Indians obtain fire by rubbing dry sticks of wood together; that a rope or carriage rein rapidly slipped through a hand pressing it will often cause a blister with excess of heat; that a spark of fire flies from the nails in one's boot knocked forcibly against the hard pavement, as from a flint and steel — are facts familiar to all. Now, whence comes the heat in these and scores of other instances that might be mentioned? The motion of the hammer, of the Indian's sticks, the rope, the boot, is either wholly or partially destroyed by the resistance which it meets, and this arrested motion manifests itself in heat. The heat due to friction of machinery is only part of the machinery's motion transformed. The heat produced in stopping the motion of a railway train would be sufficient, if all were concentrated, to reproduce the train's original motion; or that produced in stopping an Alpine avalanche to throw it back to the cliff from which it fell. The most commonly accepted theory of solar heat is that it is due to the arrested motion of meteoric bodies falling to the sun. Heat of common combustion is now explained as the clashing of minute particles of carbon, hydrogen, and oxygen as they rush together.

Motion, then, can be transformed into heat. The converse is equally true: heat can be transformed into motion. The steam-engine, whose motion is *known* to be due to the heat under its boiler, is evidently an illustration of this, but we will notice some instances which are a little less obvious. Most persons have observed that air, water, iron, and many other substances expand on the application of heat. This expansion is neither more nor less than motion. Particles of all bodies, even the most compact, are held to be in motion, — possibly like the heavenly bodies around their central sun, and, for aught we know, at relatively as great distances from each other. A nebula in the heavens appears to the naked eye as a compact mass having a definite form like a common solid, but the revelations of the telescope show that the bodies which compose it are millions of miles from each other. Our sun, with its retinue of planets, is merely a particle in the nebula which appears to us as the Milky Way. A ray of light passing between the particles of a pane of common window-glass has been compared to a bird winging its way through the mazes of forest.

Since heat is present in all bodies, even in ice, the motion of particles is due to the amount of heat the substance contains, and is proportionate to it; and any addition of heat would, of course, increase the molecular motion. It is only necessary to refer to a boy's sling, or a rapidly revolving carriage wheel in the mud, to be convinced that particles fly from the centre with increase of motion. Now, the expansion of any body is due simply to the fact that its particles in motion tend to separate from one another. With a moderate heat a substance expands; with a greater degree of heat its particles move so freely that it becomes a liquid; with still greater heat the particles lose their attraction, fly off, and form a vapor or gas.

Now, what has been shown to be true respecting heat is equally true with regard to all the other physical forces. Heat, instead of manifesting itself in motion, may be transformed into electricity; this in its turn may be changed into magnetism, and this last may manifest itself in motion. Chemical action may produce electricity, or heat, or light, or magnetism, any one of which may appear in the form of motion. Gravitation also may be transformed from motion to any one of the forms of force mentioned, or to all of them in succession. These transformations can be carried on indefinitely, and, with ordinary philosophical apparatus, can be made apparent to the senses of even the most skeptical.

Another interesting development connected with these facts is that any one form of force is not only transformable into any other, but experiment has proven that a definite amount of one force will always produce a definite amount of any other. These correlated forces can be measured or weighed with almost as much exactness as can acids and drugs by an apothecary. The idea of giving a numerical value to these forms of force in terms of the others was first brought into definite form by our countryman, Benjamin Thompson, near the close of the last century. He went to Europe during our Revolution, and became founder of the Royal Institution of London, and is more generally known as Count Rumford. He observed that while cannon for the military service, in which he was then engaged, were being bored, a great amount of heat was generated. This discovery led him to experiment in a rude way by revolving, under water, a brass cannon against a steel borer. By this means he generated heat enough to raise $18\frac{3}{4}$ pounds of water from 60° to the boiling point in two and a half hours. By estimating the amount of force employed, Rumford came to the conclusion that 940 units of mechanical force were equal to one unit of heat. The "unit of force" is the force that will raise a pound weight through the vertical space of one foot. This is called a foot-pound. The "unit of heat" is that amount of heat which will raise a pound of water one degree in temperature.

About the middle of the present century, Dr. Joule, of England, by agitating water, mercury, and oil by means of paddles moved by falling weights, also by rubbing iron discs against each other, arrived at the conclusion that 772 foot-pounds are equal to one unit of heat. This result is now generally accepted as the mechanical equivalent of heat. By use of the voltaic battery, a definite amount of chemical action upon the zinc plate, equal to the consumption of 65 grains of zinc, will produce its exact equivalent in the electrical current; and this current by its resistance in passing through an imperfect conductor will produce heat sufficient to raise one pound of water one degree, or will set free by chemical decomposition an amount of hydrogen which on being burned will produce the unit of heat. Again, this same amount of electricity will produce attractive magnetic force sufficient to raise 772 pounds one foot high. The amount of force, in any of its forms, which is exerted in producing chemical decomposition is always rep-

resented by the atomic weights or combining numbers of the elements set free.

It would require the application of tremendous mechanical power to stretch a bar of iron only the fraction of an inch in length; yet when heat expands it to the same extent, it does it at the expense of precisely the same amount of force. The same principle is forcibly illustrated by a wagon-tire, which sometimes crushes a wheel by its contraction when the heat is removed.

We might go on indefinitely with additional illustrations of these laws of force, but our limits forbid. The facts already given are sufficient to elucidate the principles in a familiar way, and that was all that we aimed to do in this brief article.

SOME PHENOMENA OF FREEZING.

More than a year ago we gave a brief account of a curious experiment illustrating both capillary attraction and the production of cold by the evaporation of bisulphide of carbon. It was reported to the French Academy by Professor Decharme, and we have since met with a fuller and more recent report which he has made of this and kindred experiments. When a roll of bibulous paper is placed vertically with its lower extremity dipping into bisulphide of carbon, the liquid rises by capillary attraction, and after a few minutes the upper portion of the paper is covered with a layer of a white, semi-crystalline substance, which gradually extends downwards to within two centimetres of the surface of the liquid. The formation of this solid substance arrests the further capillary ascent of the bisulphide. The deposit is found on examination to be ice, its formation being due to the condensation of the aqueous vapor in the atmosphere, brought about by the cold resulting from the evaporation of the bisulphide. The temperature of the air when Professor Decharme made the experiment was 20° C. (68° F.), but the phenomenon was equally striking at higher temperatures, and even when the bisulphide of carbon was in a state of ebullition. When the bibulous paper enveloped the bulb of a thermometer, the temperature fell from 20° to —15° C. (5° F.). Water in a thin test-tube may be readily solidified in this way, the test-tube being enveloped in a roll of blotting-paper the extremity of which is dipped for a moment in bisulphide of carbon. The time required for the solidification varies from two minutes to half an hour according to the size of the test-tube and the quantity of water in it. If the bisulphide holds substances in solution (sulphur, phosphorus, etc.), the same phenomenon takes place, but the deposit now contains a certain quantity of the matter dissolved. Effects similar, though not so striking, are produced when liquids with low boiling-points other than bisulphide of carbon, and when other porous solid bodies are employed.

It has been a disputed question whether, when wine containing 10 or 12 per cent. of alcohol is frozen, the ice produced is free from alcohol. According to Boussingault, the liquid obtained by melting the ice contains alcohol; but M. Melsens, who has been investigating the subject, considers that he has conclusively proved the contrary. He placed wine in a freezing mixture, in which it became, as a whole, semi-solid. This mass consisted of a net-work of ice particles of pure water imprisoned in the liquid wine, like snow impregnated with colored water. The solid particles were separated from the liquid wine by a centrifugal turbine. In this way a large quantity of ice particles was obtained almost colorless, even when the wine operated on was red. The liquid obtained from the fusion of this ice was without taste, contained no appreciable quantity of alcohol, and only a small amount of organic matter soluble in water. It is suggested that the method of congelation may be employed to improve poor wines by the removal of water.

Professor Guthrie, who has been making some similar experiments in England, has arrived at quite opposite results. By freezing mixtures of water and alcohol in various proportions (from 5 per cent. to 30 per cent. of alcohol by weight) he found that, for low percentages of alcohol, the depression of the temperature at which congelation begins below the freezing point of pure water is nearly proportional to the quantity of alcohol present. When dilute spirit is partially frozen, the crystals first deposited are almost pure ice, so that a concentration of spirit takes place in the portion remaining liquid; but with a mixture of four molecules of water with one molecule of alcohol (corresponding nearly to 56 per cent. water and 41 per cent. alcohol), the solidified portion and what remains liquid are identical in composition. When stronger spirit is cooled sufficiently to cause freezing to take place, the frozen part contains water and alcohol in the above proportions, and the liquid part is pure alcohol. In fact, Professor Guthrie's experiments seem to show that a definite compound is formed by water and alcohol in the proportion of four molecules of water to one molecule of alcohol, and that spirit containing more alcohol than this is a solution of this compound in absolute alcohol, while that containing less alcohol is a solution of the same substance in water. The freezing point of this hydrate of alcohol is —34° C. (—29.2° F.)

On the whole, we are disposed to think that the English experiments are more complete than the French, and that their results are to be accepted as trustworthy.

Some things incidentally noticed by M. Melsens are very curious, and on these he is probably not mistaken. For instance, he tells us that not only may brandy be taken into the mouth at a temperature of thirty or thirty-five degrees below zero Centigrade without any disagreeable sensation of cold, but that the mellowness of the beverage improves as its temperature is reduced. A paste of brandy or rum may be made at a temperature of —50° C. (—58° F.) and is no colder on the tongue than ordinary ice cream. If the temperature be pushed as low as —71° C. (—95.8° F.) the effect produced is similar to that of a spoonful of soup *a little too hot.*

FAMILIAR SCIENCE NOTES.

The Extremes of Temperature. — We have had unusually cold weather in New England this past winter, but of course nothing to compare with that of the polar regions. Up to the present day the maximum degree of cold ever recorded was on January 4th last, at Jakoutsk in Eastern Siberia. On that day the thermometer, as observed by a Russian merchant named Severow, registered —59.50° Réaumur (—101.8° F.). A staff-surgeon affirms that he even noted one day a cold of —63° Réaumur (—109.75° F.) in the same country, where the mercury is sometimes frozen for months together. At these times, according to Middendorf, the Siberian traveller, mercury becomes solidified and can be worked with a hammer like lead; iron becomes brittle, axes break like glass when they are used, it is impossible to chop wood; even fire itself seems to freeze, for the gases which feed it lose their heat. During the winter of 1819–20 it was impossible to go out without a mask, under risk of losing the nose or ears. In contrast to this low temperature are the extreme degrees of heat experienced in the north and east of the Sahara, at the foot of the Himalayas, in the valley of the Ganges, and on the interminable steppes of Afghanistan and Bucharia. Here the maximum heat observed has been 55° Réaumur (155.75° F.) in the shade, and 70° Réaumur (189.5° F.) in the sun. The Afghanistan proverb says, "Why, Allah, hast thou created hell? Hadst thou not already created Ghaznan?" Thus between the extreme heat in the sun in some regions and the extreme cold in others, the difference is from 125° to 130° Réaumur (281° to 292° F.), that is to say, 45° to 50° Réaumur more than the scale which connects melting ice with boiling water. But, notwithstanding this great difference, man, by the aid of the appliances invented and popularized by science, is enabled to endure both extremes of temperature.

Rubber Thermometers. — Hardened rubber, it is found, is remarkably susceptible to influences of temperature, expanding and contracting with great rapidity according to the varying degrees of heat or cold. It is proposed to make this property available for the construction of thermometers, somewhat on the principle of Bréguet's metallic thermometer. Two thin strips of rubber and ivory, eight inches long, glued or cemented together, will be flexed in one direction or the other, by elevation or depression of temperature above or below that at which they were originally joined. If one end be fixed, the other will move over a space of one or two tenths of an inch for a change of 1° Centigrade. The expansibility of hard rubber being greater than that of mercury at ordinary temperatures, it would be possible to construct a mercurial thermometer with a bulb of this material, in which the column would rise with elevation of temperature and fall with depression.

HINTS FOR EXPERIMENTS.

Soap-Bubble Experiments. — Some interesting investigations as to the diffusion of gases through the walls of soap bubbles have recently been described by M. F. Müller, to the Berlin Chemical Society. One of these makes a good lecture experiment. An air-filled bubble, with pipe, is fixed by a support under a bell jar containing ordinary gas. After half a minute, the bubble contains an inflammable mixture of gas and air. To show this, it is taken out, and the india-rubber tubing, with cock, which closed the pipe, is removed, and a light is applied to the pointed end of the pipe, out of which the gas slowly issues from the contracting bubble. A flame is produced, very small, indeed, but a match can be lit at it, and thus its existence made more evident. The interior of the bell jar should be previously moistened with water; the bubbles, in that case, last longer, sometimes over four minutes. The author also demonstrates Graham's law, showing that the lighter gases pass through the liquid film more quickly than the heavier.

The Effect of Rain in Calming the Sea. — At a recent meeting of the Manchester (Eng.) Philosophical Society, Professor Reynolds read a paper to show that the notion of sailors that rain tends to calm the sea is confirmed by scientific investigation. In order to understand how the falling rain checks the wave motion, fill a tall glass jar

with water, and having colored the topmost layer, allow drops of water to fall into it with some force. It will be seen that each drop sends down one or more masses of colored water in the form of vortex rings, which rings descend with gradually diminishing velocity and increasing size several inches (18 very frequently) below the surface. Each drop sends down, as a rule, more than one ring; but the first is better defined and descends more quickly than those which follow it. It is better to color the upper layer of the surface than to use colored water as the "rain," because the first ring appears to contain very little of the water of the drop which causes it. It would appear from this that rain, besides the "splash" and surface effect, causes the water at the surface to change places rapidly with that at some distance below, and consequently it has some effect in destroying wave motion.

Explosive Paper. — Make a mixture of saltpetre, 8 parts; chlorate of potash, 5 parts; charcoal powder or pulverized coal, 1 part; fine sawdust of hard wood, 1 part; and a little mucilage, gum, or other binding material; put water enough on it to change it into a pasty mass, work it well through, and soak strips of heavy blotting-paper in it. If you dry these strips you obtain explosive paper; if you roll them up tightly when wet and let them then dry, you obtain little blocks which, when confined and fired, will explode with great violence, but will not easily go off by percussion or friction alone.

USEFUL RECIPES.

Washing Black and White Prints. — It often happens that black calico, and other printed goods which have a white pattern on a black ground, will not bear washing unless some precautions are taken to prevent "running;" or in other words, the white spots acquire a reddish color, and the black ground becomes dull and foxy. A case of this kind having occurred in Stuttgart, the dress was sent to the Royal Laboratory there, and the following method resorted to, which proved successful: A sufficient quantity of water was put in a wash boiler and heated to the boiling point. There were then dissolved in it fifty grams red chromate of potash, eighty grams common salt, and sixty grams crystals of sal soda. The dress was put into this hot bath for five minutes and frequently turned and stirred, and then washed in clean water until the white spots appeared perfectly bright and clear.

Macaroni Sauce Piquante. — Mr. S. Bottone, in the *English Mechanic*, says that *salza piccante* for cold meat is prepared in Italy in the following way: "Take 2 oz. of fine curled fresh parsley, half a dozen leaves of mint, and one clove of garlic; chop very fine. Now beat up quarter of a pint of good white wine vinegar with a teaspoonful of oil, and add the chopped herbs. For dressing boiled cauliflowers, boiled cabbage, etc., the following is an excellent variety: Take two plump anchovies, rub them to a paste in a mortar with a small pinch of cayenne pepper. Now add one clove of garlic and one teaspoonful of olive oil. Lastly, throw in a quarter of a pint of hot white wine vinegar. Use hot. It goes well with cold fish when cold."

An Apt and Beautiful Comparison. — Tyndall says of Faraday: "A favorite experiment of his own was representative of himself. He loved to show that water in crystallizing excluded all foreign ingredients, however intimately they might be mixed with it. Out of acids, alkalies, or saline solutions, the crystal came sweet and pure. By some such natural process, in the formation of this man beauty and nobleness coalesced to the exclusion of everything vulgar and low. He did not learn his gentleness in the world, for he withdrew himself from its culture; and still this land of England contained no truer gentleman than he."

Practical Chemistry and the Arts.

ZINC.

It is a singular fact that although brass was known to the ancients, and used by them for a variety of purposes, zinc was not recognized as a distinct metal until modern times. The ancient brass was made by mixing certain ores of zinc with copper, and the pure metal was not separated from these ores before the thirteenth century, when it seems to have been known to Albertus Magnus. We hear nothing more of it until the sixteenth century, when it was first clearly described by Paracelsus, who gave it the name zinc. Again we lose sight of it for a long period, for though the alchemists were acquainted with it they kept it to themselves in the hope that it might prove useful in the transmutation of other metals to gold. Up to the early part of the last century it was an extremely rare substance, and used only in alchemy. About 1721 it began to be obtained from calamine in Saxony, and in 1743 the process was brought into England, the first zinc works being founded at Bristol. Long before this, however, zinc had been known in China and India, whence the Dutch brought it to Europe under the name of "Indian tin."

The present production of zinc in Europe exceeds 100,000 tons annually, and the demand for it is rapidly increasing. Immense quantities are used for roofing and other architectural purposes, and for coating or "galvanizing" iron. It is also employed largely for making the well-known "zinc white," which is an oxide of the metal. Some of its salts, as the sulphate or "white vitriol," are of great importance in the arts, but these are found native to a considerable extent, and are also obtained from other native compounds of the metal.

The most important of the modern applications of zinc is in the galvanic battery. What steam owes to coal, electricity owes to zinc. It is the fuel which is burned to keep the electrical machinery going. The electric telegraph, electroplating, and electro-metallurgy in all its forms may be said to owe their development in great measure to this metal. For practical and commercial purposes no other known material could take its place.

Of the minor uses of zinc it was not our purpose to speak, but one which has lately been noted is curious enough to be worth mentioning. An engineer on the steamship St. Laurent, which runs between Havre and New York, had accidentally left an ingot of zinc in one of the boilers. At the end of the trip he found the metal wasted away, but the boiler was free from the incrustation which it is usually so difficult to prevent. Since this fact was published, it appears that zinc has elsewhere been used in boilers for the same purpose, and that it is effectual in preserving the iron from oxidation. It is said also that it prevents the rusting of steam-pipes used for heating buildings.

MEMORANDA IN THE ARTS.

An Electrical Tinder-Box. — A Frenchman has just invented a simple little apparatus which may interfere somewhat with the match trade. It is called the electrical tinder-box, and is small enough to be carried in a cigar-case. On opening this box you see a platinum wire stretched across. Touching a spring the wire reddens sufficiently to light a cigar. At will you can introduce into a tiny sconce a mesh of cotton steeped in spirits of wine or petroleum, which, taking fire, does service as a *veilleuse*, or nurse's lamp. The hidden agency which heats the wire is a very small electrical battery, set in action by the touching of the spring.

"Weighted" Black Silks. — M. Persoz, in the *Moniteur Scientifique*, shows that "weighting" — which began with the modest aim of making up the loss sustained in ungumming — is now carried to the extent of 100, 200, and 300 per cent. This increase of weight is produced by treatment with salts of iron and astringents, salts of tin and cyanides. The bulk is augmented proportionably to the weight. As a matter of course, the chemical and physical properties of the silk thus treated are materially modified. What is sold as silk is, in fact, a mere agglomeration of heterogeneous matters, devoid of cohesion, held temporarily together by a small portion of silk. The elasticity and tenacity of the fibre are sensibly reduced. Though in its natural state one of the most permanent of organic bodies, and sparingly combustible, it burns like tinder if touched with flame. It is, moreover, liable to undergo spontaneous decomposition, and to absorb gases with the evolution of heat, which sometimes leads to actual combustion. The adulterated silk when burning scarcely gives off the characteristic odor of animal matter. It leaves an ash of oxide of iron, exceeding eight per cent.

An English Compliment to American Axes. — "An occasional correspondent," says *Iron*, in a short article upon American axes, "writing from the South African gold fields, refers to these tools after a fashion which ought to put Sheffield on its mettle. English mining shovels he praises, those of one maker he describes as very nearly perfection. But while giving scant commendation to English crowbars and picks, he disparages English axes terribly. 'No one here,' says he, 'will look at an English axe; it was the same at the diamond fields, and also in Australia and elsewhere. The trade in these implements is so large that I think it right to call attention to our neglect of it.'"

Novel Industrial Exhibition. — At the Lambeth police court, in London, not long ago, there was exhibited a most complete set of house-breaking tools, including "jimmies" of all sizes — one a most formidable article called an "alderman," which measured about four feet, but could be taken into two pieces. There were also gimlets, chisels, dark lanterns, a rope ladder such as is used for mounting porticoes and balconies, and a large number of skeleton keys, wedges, etc. One feature of the exhibition was a leaden hammer capped with leather, which it was stated was used for the purpose of driving wedges into safes, the leather causing the blows to be almost noiseless. There were other adjuncts to this strange display, including wax tapers, pieces of rope, woollen pads such as burglars put over their boots to enable them to move about the house without making a noise, and many other similar appliances. Safe and lock manufacturers have expended much scientific and mechanical skill in protecting property, and they have been met with an almost equal art on the part of the class of workmen who are retained on the other side; for many of these house-breaking implements are not only beautifully made, but are designed with much ingenuity, both for concealment and for use.

LABORATORY NOTES.

New Method of Filtration. — Professor C. A. Seeley has invented a new method of filtration. At the bottom of an open glass tube, say an inch in diameter, he places a piece of filtering paper, and over this a piece of India muslin, which is secured around the tube by a rubber ring. The tube is

filled with the liquid to be filtered, and is closed at the top with a rubber stopper through which runs a piece of rubber piping. The tube is connected with two bottles, so arranged that the water in the upper one flows down into the lower one, forcing out the air, which in turn runs through the rubber pipe, forcing out the liquid through the filtering material. The arrangement is exceedingly ingenious, and by this means a liquid may be filtered in one fourth of the time which the operation takes by the old method.

To Detect Cotton in Linen Fabrics. — To detect cotton woven into professedly linen fabrics, it is well to know that linen cloth, when dipped in an alcoholic solution of rosolic acid, next in a concentrated aqueous solution of carbonate of soda, and finally washed several times with strong soda, attains a beautiful red color, while the cotton fibres are not dyed. Before testing, the dressing should be washed out of the goods and a few threads ravelled out on each of three sides.

PRACTICAL RECIPES.

To Make Engine Hose Water-Tight. — The *Bayerisches Industrie und Gewerbeblatt* describes a process which has been patented in Bavaria for rendering hose of fire-engines completely water-tight, so as to withstand the greatest pressure. The hose after being cleansed and dried is impregnated with a mixture of 100 parts of glycerine of 23° Beaumé and 3 parts of carbolic acid, which may be done either by drawing the hose through the liquid, or, better still, by brushing it well in. Thus treated, the hose preserves a certain degree of dampness, without, however, being liable to rotting in the least degree, and so suffering deterioration in quality and durability. The brass fittings of the hose are attacked only imperceptibly by the acid contained in the composition; but even this may be easily prevented by giving them before impregnation a coating of weak shellac varnish, or by greasing them well with tallow. The hose must be cleaned every time they have been used, dried, and impregnated anew with the liquid. The previous drying of the hose is, however, not necessarily essential, more especially in winter, when drying is slightly difficult; it suffices to let the water run well out of the hose.

To Color Gold Chains, etc. — The *English Mechanic* says: Several methods are employed, according to color required and goodness of alloy. In all cases a preliminary cleaning with aqua-fortis, and subsequent rinsing, will be necessary. For yellow gold, take 6 parts of saltpetre, 2 of copperas, 1 of white vitriol, and 1 of alum. Powder finely, mix, and add water, before applying. For green gold, 1½ parts of saltpetre, 1¼ of sal-ammoniac, 1¼ of Roman aloes, and ½ part of verdigris, well mixed, and moistened with water. For red gold, use sal-ammoniac, blue vitriol, alum, and borax, equal parts; powder, mix, and moisten with water. For general work, use common salt 1 part, alum 1 part, saltpetre 2 parts; the whole well powdered and mixed. To use these, place them in a plumbago crucible (not metal) with a small quantity of water. Heat until the composition begins to boil. Having suspended the work by a horse-hair, place it in the crucible, and allow it to remain there, moving it about for seven minutes. Withdraw, and rinse well in a pipkin of boiling water. The color will now be dark, nearly black; again dip and rinse, and repeat until the work acquires the desired rich tint. Finish with scratch-brush or burnisher, and dry in boxwood dust.

Cleaning Gilt Picture-Frames. — The London *Furniture Gazette* commends the following as a good method: Take one drachm of soft soap and mix it gradually with half a pint of soft water, *i. e.*, rain-water, or water that has boiled and been allowed to get cold; put the mixture into a bottle and shake it well up, then add half a wineglassful of spirits of hartshorn, and again well shake the ingredients. The gilt frame that is to be cleansed may now be brushed over with this liquid, taking care, however, to use for that purpose the very softest camel-hair brush that can be procured. After the liquid has been on the frame a minute or two, with a slight brushing to the dirtiest and most intricate parts of the work, it should be freely washed off with plenty of clean, soft water, and allowed to dry of its own accord. The drying should be accelerated by placing the frame in a draught, or where the sun shines on it. Next day the bright parts of the work may be very slightly rubbed with a new wash-leather, which will enhance their brilliancy. Pictures and glasses should be taken out of their frames during the cleansing process. The following is another method also spoken of: Mix up 15 grains of chlorine water with 45 grains of white of eggs, and then wash the frame with a soft-haired brush dipped into the mixture. Afterwards varnish the frame with wood-gilders' varnish, which can be obtained of any dealer in paints. The chlorine water can be purchased cheaply at the apothecary's.

Agriculture.

THE LAND OF ORANGES.

A friend in Florida has sent us the printed proceedings of the Florida Fruit Growers' Association, which we have read with unusual interest. The convention, which met last autumn to discuss fruit and fruit-growing, embraced a large number of the most intelligent and enthusiastic farmers and horticulturists in Florida, and in their report they have embodied a large amount of information useful to every one interested in the prosperity of the State. Of course the leading fruit discussed was oranges: how to grow the trees, improve the fruit, and find for it a market. Within the past ten years the production of oranges in Florida has increased immensely, and the importance of the crop in the future can hardly be overestimated. It was stated by gentlemen at the convention that the product in two years would, if no disaster occurred, reach to 400,000,000. To convey the fruit to Northern ports, for a market, a semi-weekly line of large steamers will be required. A new line of freight steamers owned by New York parties has commenced regular trips between that port and a point on the St. John's River, and the success of the line is placed beyond a doubt.

The future of Florida is promising, if political and social troubles are not allowed to divide and distract the people. The climate is delightful in winter, and we predict that within a quarter of a century it will be as much a matter of course for well-to-do Northerners to spend their winters in Florida, as it is for them to go to the seaside or the mountains in summer. We learn that "the land of oranges" is crowded with strangers at the present time, and if this winter flight continues to increase as it has for the last ten years, there will be mouths enough at home to consume all the nice fruit the farmers can raise, and so steamships will not be needed to export it. Beside oranges, bananas and grapes can be grown there in great perfection. The frosts come occasionally to annoy the fruit grower, but statistics show that the risk is small, even in the northern portions of the State. We say, success to the fruit growers of Florida.

TREES AND SHRUBS IN OREGON.

Dr. Matteson, of Coquille City, Oregon, has sent to us by mail a package of myrtle plants with specimens of several other curious and interesting vegetable productions common in that distant section. The condition of the plants after their long journey in the mail-bags is such that we fear they cannot be forced into growth, even by the most careful attention. With them came also a bag of myrtle nuts, and from these we have more hopes of growing the plants, so beautiful and desirable. The doctor will send the plants to any one upon receiving ten cents for each, to pay for trouble, postage, etc., or the nuts for fifty cents a pint. It is quite probable that the myrtle will flourish in the Middle, and possibly in the Northern States, and if it is propagated it will add greatly to our list of ornamental, odorous flowering trees. Oregon is a remarkable State, and its vegetable productions are novel and interesting. Trees grow to an enormous size, and we are informed that it is not uncommon to find them three and four hundred feet high. Dr. Matteson is burning wood in his stove which came from a tree so great in diameter at the butt, that after it was felled, access to the top could not be gained without a ladder.

The live oak grows there in great luxuriance, and also among shrubs there is the wild flowering currant, which is very beautiful as a forest flower. Rhododendrons cover large tracts, and grow from ten to twelve feet high, giving when in flower, a magnificent appearance to the landscape. Our country is so vast, and its productions so varied, that it will be many years before we shall fully understand by observation and study its treasures of shrubs, flowers, and trees.

THE WINTER DROUGHT.

This is extraordinary in this section, and gives much trouble to farmers and others who have large numbers of animals to care for. Wells and springs are dry to a great extent, and water is obtained in some localities only at large expense, from rivers and ponds. One lesson will be learned from this drought, and that is, wells must go deeper than has hitherto been thought necessary.

The expense of digging out the last five or six feet of a well is much greater than that of any other portion, and hence the temptation is strong to suspend excavating before the deep springs are reached. This is poor economy, as the whole labor is lost if a well is not carried deep enough to supply water in the dryest time.

Much depends upon the position of a well. It is often the case, that success for an abundant supply of water depends upon locating the well at a certain point within an area of ten feet. There is unfortunately no method by which we can know with certainty the best point at which to dig. Experienced persons, those with an instinct rendered acute by observation and experiment, are the best judges, and it is well to consult such, if they can be found, in the neighborhood where wells are needed. At the farm in the low lands, by the farm buildings, we have two wells, both of which have failed, the present winter. A new well upon the hill, one hundred feet higher, and but a short distance away, gives an abundant supply; it has had nearly twenty feet of water when at its lowest point. This is a curious circumstance, and is a fact not easy to explain.

COAL-ASHES AND SAND.

Professor Storer, the accomplished chemist at the Bussey Institution, presents in the *Bulletin* some valuable results of investigations of the fertilizing value of coal-ashes and sand. In the use of sand upon a peat meadow, the upland grasses usually spring up spontaneously, and large crops result. This has been noticed by every farmer who has tried the experiment. Silicious sand, such as comes from the banks of drift in New England, has not been supposed to contain any special fertilizing material, but Professor Storer shows that this is a mistake. He discusses in the light of a series of interesting experiments the comparative value of coal-ashes and sand as supplying plant nutriment.

"It is plain," he says, "that no *general* answer can be made to the question whether coal-ashes possess more fertilizing power than sand. For, inasmuch as the experiments prove that the coal-ashes examined were no better than a sample of pit-sand of nearly equal bulk, selected at random, the question as to the relative merit of ashes and sand necessarily becomes a special one, which must be asked afresh for the sand of each new locality, and which can be answered only by experiments made upon each particular sand. The fact remains, however, no less interesting than remarkable, that an average sample of the apparently sterile silicious sand of this vicinity has been found to contain appreciable quantities of potash and phosphoric acid in a condition fit to be taken up by plants on the addition of nitrogenized compounds. This fact explains at once the power of bearing trees which is possessed by much of the sandy and gravelly 'drift' of Eastern Massachusetts. As is well known, many of our drift hills and ridges have been devoted to the growth of hard wood incessantly for a very long period. Every twenty or thirty years the trees are cut down, and, the sprouts which spring from their stumps being suffered to grow, a new crop of fire-wood is found ready for the axe at the end of another term of twenty or thirty years. This practice of continually growing and carrying off a single crop without respite, manure, or rotation has already been adduced by Professor Johnson as an excellent illustration of what farmers call working on the natural strength of the land. But the experiments of Series C go to show that in some instances at least, and probably in most, where trees flourish upon drift, the elements of strength are contained in the very sand itself. So long as there is a deposit of humus on the surface of the land to supply the necessary nitrogen, there is no need of supposing that much of the food consumed by the trees must be brought to them from afar by the soil-water, for, as has just been shown, the sand may be competent to supply potash, phosphoric acid, and the other ash ingredients.

"The experiment enforces the lesson that glacier sand (such as composes the New England drift) is ordinarily a very different thing from the sea-sand of the dunes upon the Atlantic coast. It is plain, for that matter, that a quantity of crushed rocks and minerals slowly undergoing decomposition and disintegration, through the agency of fresh water and the matters held in solution by such water, in heaps or hills such as glacial action has thrown up all over the Northern United States, must usually contain a much larger proportion of plant food than sand that has been formed upon sea-beaches from the same kinds of rocks. From the sand that forms the dunes almost everything but silica has doubtless been removed through long-continued grinding of the rocky materials upon the beach in a saline solution that was continually changed and renewed."

SEEDING GREENSWARD IN SPRING.

Several years ago I had a field ploughed in the fall for planting the following spring. On one side was a level strip of lowland, which had been well turned by the plough, and which was not needed for planting. I manured the field all alike, and worked it down smooth and fine. After it was ready to plant, I asked myself why a piece of greensward cannot be made to produce grass just as well sown in spring as old ground, provided it is rich and mellow? Thinking that perhaps I should never know without trying it, I decided to seed this strip to grass alone, and the experiment was so entirely successful that I have never since hesitated to sow grass on greensward in spring, whenever, from any cause, it seemed desirable to do so.

I do not claim that this is the best way to reseed, but that, under certain circumstances, it is a good way. If I were intending to adopt this method, I should plough early in the fall, apply the manure at any convenient time, and go over the ground with a harrow or cultivator about every ten days or two weeks, as long as it remained unfrozen.

It would then be fine, mellow, and somewhat rotten, and after one or two good harrowings in the spring, would be in good condition to receive the seed. In this way no crop is lost. I have one field of moist meadow land that has been treated in this way for several years, never cutting less than two crops a year and usually three.

The above is from Mr. Cheever, the sensible editor of the *New England Farmer*, and we fully coincide in the views presented. We have for several years seeded greensward in the spring, and always with satisfactory results. At the present time there is at the farm two or three acres of land which was ploughed in the fall, and, after thorough pulverizing with the harrow and crusher, was seeded late in November. This was done to save time in the spring when farm work presses. The seed has not germinated, but as soon as the ground is dry and warm it will spring up, and two good crops may result.

NOTES AND MEMORANDA.

An Enemy of the Potato Bug. — Professor Beasey, of the Iowa State Agricultural College, says that the red-breasted grosbeak is the natural destroyer of the potato beetle. This statement has been corroborated by others. Mr. S. B. Higgins of Baxter, Iowa, gives an account of his observations to the same effect. He has watched them flutter about the potato vines like humming-birds, apparently picking and eating the bugs very fast. He also learned from one of his neighbors that these birds effectually exterminated the potato bug from about two acres of potatoes which were planted near some timber. This bird is described as one of our native birds, abounding in the entire territory of the United States north of the Gulf Coast. "The male has a short heavy beak, black head, back, and wings, with three white bands on the wings, part of the outer tail feathers white, and a red, rose-colored breast, the color extending under the wings; it is about eight inches in length. It feeds on grain, berries, and insects, and is one of the few insect-destroying birds that devours the potato bug."

Brutality to Cows. — "A Dairyman and Doctor" sends to the *New York Tribune* the following particulars of the loss of a valuable cow from a large tumor upon the udder. "The cause of the tumor — which was really what is known as a neutral hernia or rupture of the abdominal sac — was a kick by a brutal attendant. I have seen thoughtless persons, angered by what they were led to regard as stubbornness or viciousness of a cow, and forgetting the serious danger of a kick or heavy blow, thus abuse the poor animal, whose only fault was really bewilderment at the violent and unreasonable treatment to which she was subjected. Nothing could be more cruel and injurious, or more foolish, for in this way a man destroys his own valuable property. Repeatedly I have applications for advice about swellings, tumors, and inflammatory disorders of cows and oxen, which are, more than probably, in great part due to ill treatment of this character, or accidents from injuries by other cattle, which might have been avoided by care and watchfulness. . . . I would enforce the extreme cruelty of beating or kicking a cow, and in addition its worse than uselessness; for the cow — a naturally gentle animal — is rendered fearful, apprehensive, wild, and rebellious by it, and her management is made infinitely more difficult. No animal is brought by kind, considerate treatment, from calfhood up, nearer to a well-regulated, smoothly-running, and perfectly manageable machine, than a cow."

An Enormous Yield. — A correspondent of the *Rural Carolinian* tells a big story about the sweet potato. In 1871, having a specimen which he desired to multiply to the largest possible extent, he first cut it into pieces, each with about two inches square of skin. These he planted February 10th, in a rich, warm spot, which had been occupied as a hog-pen. They grew finely, and on May 18th he took from them two hundred and two vine cuttings, which he planted, and he continued this cutting and planting till August 10th, planting in all something over ten thousand cuttings. The crop was not measured, but experienced farmers estimated that there was at least *one hundred bushels*.

Wooden Floors for Horse Stalls. — After twelve months' trial, a London cab-proprietor has come to the conclusion that to stable his horses on a wooden grating is far preferable to leaving them to stand on brick or stone. He has fitted two stalls with a grating of wood, 2 in. thick by 3 in. broad, with a space of ¼ in. between each two planks, the whole bolted together by three iron rods and three cross-pieces. He says that the horses lie high and dry, and he saves by that means in straw 20 per cent. The frame can be removed and the bottom washed down, and thus there is a gain in comfort and cleanliness.

Fern Culture. — A correspondent of the London *Journal of Horticulture*, being dissatisfied with the results obtained by his gardener in cultivating ferns in the usual way, devised a plan of his own, which he describes as follows: "The hole in the bottom of the pot being broken out very much larger than the maker leaves it, I put in three or four pieces of broken pot, then some rich soil and old manure, just what should be used for cucumbers, no peat, no sand; then I put in the fern, and very gently fill the pot with good garden soil intermixed with a few small bits of soft brick as large as peas. The pot is placed on soil or ashes, perhaps partially plunged, perhaps surrounded with lycopodium. In any case the soil is always kept quite wet, in fact muddy, and the ferns grow as I never saw ferns grow before. The whole secret is in keeping them wet and warm, partially plunged, and thoroughly drained. You may take a pot-bound fern, pull roughly the drainage from the roots, break off the fibres anyhow, re-pot it in wet soil instead of dry, and it will grow and flourish as it never would with ordinary treatment. I planted less than two years ago a little bit of *Adiantum Farleyense* root without a frond on it, and it now measures 10 ft. 6 in. round."

Perennial Potatoes. — English journals state (but we do not vouch for the truth of it) that M. Tellier, of Paris, has discovered a method of cultivating potatoes by which they multiply indefinitely, the sap in winter being engaged in performing underground work, increasing the size of the tuber, and improving its flavor.

Boston Journal of Chemistry.

JAS. R. NICHOLS, M. D., *Editor.*
WM. J. ROLFE, A. M., *Associate Editor.*

BOSTON, APRIL 1, 1875.

POISONOUS WATER PIPES.

IT is well known to many of our readers that the JOURNAL, for a period of nearly two years, urged the discontinuance of zinc-washed or "galvanized" iron pipes for water conduction, on the ground that they were very unsafe for such uses. We endeavored to awaken medical gentlemen to the importance of the subject, but the views and facts presented were disputed, and even ridiculed, by some distinguished guardians of the public health — gentlemen whose opinions were and are entitled to great weight upon sanitary questions. The force of the reasonings of these gentlemen, however, upon the question, we could never appreciate; no results of investigations were presented in support of the theory that the salts of zinc, as found in the water passing through zinced pipes, was harmless, and the view rested almost entirely on the known fact that the oxide, carbonate, and other zinc combinations were used in medicine, with no deleterious effects. The discussion of the question directed the attention of the Massachusetts State Board of Health to the matter, and last year a report was published by Dr. W. E. Boardman, of this city, which evinced much research and painstaking. It may be regarded as an exhaustive treatise in some respects, and presents about all that the literature of the topic affords, foreign and domestic. But this report, although very creditable to the author, falls far short of establishing the truth of the theory that the metallic combinations removed from zinced iron pipes by the action of water are harmless to the animal economy. The fact certainly should be kept in view, that in quite all the experiments made by physicians and others, the salts of zinc used upon men and animals, as noted by Dr. Boardman, were not procured or employed under circumstances fairly elucidating or settling the question now at issue. Neither do the expressed views or testimony of pipe manufacturers and officers of water boards, or the negative testimony of physicians, even, settle the question. This kind of testimony is far from being satisfactory when placed beside facts which prove indubitably that cases of poisoning from the sources named *have* occurred in a considerable number of places where these pipes are used.

The argument that as zinc salts are safely used in medicine they are necessarily harmless to feeble women and children, when swallowed in minute quantities in daily foods and drinks, seems to us to be unsound and untenable. Nearly all our active poisons, organic and inorganic, are used as remedial agents. They are used under proper supervision and restrictions, and for a purpose. Mingle them with food, even in infinitesimal quantities, and scatter the food in families; does any one doubt the result? Lead is a therapeutical agent, and is often used by physicians; does this fact prove that it is harmless when introduced into the system through the agency of potable waters? Chemists who examine waters which have passed through "galvanized" pipes state that they find oxide, carbonate, and sometimes sulphate and chloride of zinc. The action of ordinary well and pond waters upon the zinc coating is first to form the oxide of zinc, and this by absorption of carbonic acid is soon changed to a basic-carbonate. This is the form in which it is held in *suspension* in water. We have, however, good reason to believe that some zinc remains *dissolved* in the water; but in what form or state this exists we do not know, and further, as Professor William R. Nichols puts it, "we probably never can know."

In considering the toxical relations of the agent or agents found in water brought in contact with zinced iron pipes, we must not be led into error from any prejudices or superficial reasonings. We are dealing with agents which exist under peculiar circumstances, and which also enter the system under peculiar circumstances; and if the science of the age teaches and enforces any one truth with peculiar emphasis, it is that minute portions of many substances not regarded as specially poisonous cannot enter the system with the daily foods and drinks without seriously disturbing its normal condition. And further, it teaches that the idiosyncrasies of individuals must be regarded in our sanitary regulations; some organizations are peculiar, and remarkably susceptible to disturbing agencies, and these peculiarities are found in families as well as in communities.

In another place will be found an important report of some cases of zinc poisoning, which has led to these remarks.

COLD WEATHER IN ENGLAND.

THE past winter is represented by correspondents abroad, and also by English journals, as having been severely cold and unpleasant in Great Britain. The impression prevails that the winters are growing more inhospitable, with heavy snowstorms and severe frosts. The people of the United Kingdom have been shivering with the cold in their stone dwellings, and the inadequacy of their present methods of securing household warmth is admitted on all hands. The ordinary coal grate is used by the English people almost universally, and the rise in coals leads to economy in their use. The American method of warming by furnaces in cellars and basements is almost unknown in England, and the people are strangers to the comforts which American houses afford, as regards warmth. At the present time attention is directed to our methods of house-warming, and within a few weeks orders have been received from parties in London for several of the wrought-iron furnaces which we devised in 1870. This device is well adapted to supply the great want felt in England for better methods of heating. It will in its safe, sanitary, and economical features meet with favor on that side of the water. We are confident the scientific men of England will give it their warm approval, as it does away with the objections which have been urged against the ordinary devices of cast iron so common in this country. We trust it will contribute to the comfort of English households as fully as it has to that of thousands in the United States.

"THE New Scriptures according to Tyndall," etc., published in the JOURNAL for February, is going the rounds of the English scientific and medical press, and is regarded as "an exquisite bit of satire."

THE CHINA TRANSIT OF VENUS EXPEDITION.

THE subjoined extract from a private note sent to us by Professor Young, dated Peking, China, December 15, 1874, would have appeared in the last number of the JOURNAL had it not arrived a few days too late. Knowing that his numerous friends would be glad to hear from him and his party, we sent the extract to the *Daily Journal*, of this city.

The professor has safely reached home, and we congratulate him upon the success of the expedition towards which he so essentially contributed. His journey has been a long and arduous one, but doubtless full of interest and important results to the cause of science.

Our party, consisting of Prof. J. C. Watson of Michigan as chief, myself as second, I. P. Woodward of San Francisco as astronomical assistant, W. V. Ranger of Syracuse, N. Y., as chief photographer, and E. Watson, M. D., and B. J. Conrad, both of Michigan, as his assistants, gathered at Chicago on the morning after the fire, and on the 16th of September, just two months later, arrived safely in Peking without meeting anything unusual in the way of adventure or accident. We soon found a very suitable station for our observations, on the premises of the English Church Missionary Society, which kindly allowed us the use of the necessary plot of ground rent free. The place is in the so-called Tartar City (Peking consists of four distinct parts — the Chinese City, the Tartar City, inside of this the Imperial City, and inside of this latter again the Prohibited City, or Palace Ground), about a quarter of a mile north of its southern wall, and about a mile from the western wall. The only objection to the place was that we could obtain no residence very near it, but were obliged to live about three quarters of a mile away.

Our buildings and instruments were all erected and in use early in October, and Professor Watson was soon at his old business — discovering asteroids. Probably your columns have already contained some notice of that found by him on the 10th of October, to which Prince Kung, at his request, has assigned a name, namely: Jue-wha-tsin (pronounced Zhu-dy-whar-tsin), the star of China's fortune.

The time until the transit was very closely occupied with the observations for determining our latitude, longitude, and time, and for ascertaining the behavior of our clocks, chronometers, and other instruments, especially the photographic, under the varying circumstances of weather and temperature. The amount of labor expended in this direction was very great, observations being made every clear night, occupying from three to eight hours, while nearly every clear day three or four hours were spent in photographing. The weather in Peking is, at this time of year, generally very clear, and more so by night than by day, so that out of the seventy-five nights during which our instruments have been in position, nearly sixty have observations.

As the transit approached our preparations were gradually completed, and the morning of Wednesday, the appointed day, found everything in entire readiness. Sunday and Monday had been exceptionally fine, Tuesday had clouded up about ten o'clock, but cleared again in the evening (a not unusual way of the weather in Peking), so that the night was fine, and Professor Watson had no difficulty in procuring all the needed observations. By daybreak we were all on the ground and ready to take our posts. The sun rose cloudless and our hopes were high as we proceeded with the preliminary measurements. The first contact was to occur at half past nine. Before nine, clouds began to form, and it became evident that our operations were to be much embar-

rassed, if not altogether vetoed, by the weather. You can perhaps imagine that I personally felt a very keen pang of disappointment as I removed the spectroscope, with which I had hoped to observe the first contact, and substituted an ordinary eye-piece. We proceeded otherwise, however, to take our posts as if nothing had happened, until Mr. Woodward, on trying to "switch in" the clock upon the chronograph sheet, announced, to our utter horror, that the electric circuit was broken. The electrical arrangements had never previously given us a moment's trouble, and had been in full operation not an hour before. After the first two contacts were observed I soon found and repaired the break, which it since appears was caused by a careless water carrier running his cart directly over the wires as they lay above the ground, insulated like an ocean cable and covered with several inches of straw and matting. There was of course no time then to hunt up the difficulty, so Mr. Woodward was obliged to share my disappointment, renouncing his hopes of observing the contacts with the telescope, and taking upon himself the office of the chronograph, which was intended to record the moments when the photographic plates should be exposed.

Professor Watson and myself both obtained, through thin clouds, satisfactory observations of the first two contacts, which came nearly a minute later than the computed time. Quite a number of pictures were made, a few good, but mostly poor. Soon after the second contact the clouds became thicker, and for more than an hour things looked very hopeless, so that our visitors — the American minister and some of his friends — condoled with us in the most sympathetic manner. But soon after one o'clock it became evident that the clouds were breaking in the west, and that we might hope for better things. About half past one the sun shone out in a sky cloudless, but still obscured to a great extent by a dense yellow haze of dust, which, while it affected our telescopic observations very little, sadly interfered with the photographic. The last two contacts were observed very satisfactorily by all three of the astronomers, Mr. Woodward being set at liberty as soon as the telegraph wire was repaired.

On counting up the photographs, we find that ninty-nine plates were exposed. Of the resulting pictures, about one third are worthless, one third are tolerable, and one third are good. The French party here had just about our fortune. On the whole we congratulate ourselves on the amount of success obtained, considering how narrowly we escaped a total failure.

In a few days, as soon as we can close up the observations and pack our instruments, we start for home, by what precise route is even yet uncertain, as communication in the winter, when the Pei Ho is frozen between Peking and the sea, is very difficult and precarious. We have some hopes of reaching a merchant steamer at Taku next week; failing that we must push on to Chikiang on the Yangtze, five hundred miles, in carts. In any case we expect to reach Shanghai before the end of January, and home in March, unless something now unforeseen prevents. The health of the party has been excellent, almost without exception. C. A. YOUNG.

ON THE MEASUREMENT OF AIR-ANGLE OF MICROSCOPE-OBJECTIVES.

BY R. B. TOLLES.

ABOUT one year since an objective of Boston manufacture was purchased by a London gentleman, and falling under the notice of Mr. F. H. Wenham, of that city, received an extended notice at his hands; much to its disparagement in one respect. He devoted an article to decrying its claims, and to certain deductions from *his testing*. Now, it is true that no man in England probably would be more trusted in English circles in such a matter than Mr. Wenham. And this position he has gained by actual contributions to optical means, especially accessory means, of the microscope.

I propose to scan his teachings in this matter, necessarily somewhat personal to myself, but my scrutiny shall be gauged for public utilities.

The objective he measured was marked for maximum air-angle. Mr. Wenham was incredulous, and though, as he says, "light was seen up to 180°," he proceeded to demonstrate that large angle (to say nothing about 180°) was impossible from the circumstances of the case of this objective. And this is the way he does it.

To begin with, *he completely closes the systems* by means of the adjustment for cover. He then measures the focal distance, in air, and the exposed portion of the front face of the front lens, thus: Focal distance, .013 of an inch; diameter of front surface, .043 of an inch; and gives a diagram according to Fig. 1, below, — increased about 38 times of the decimal dimensions.

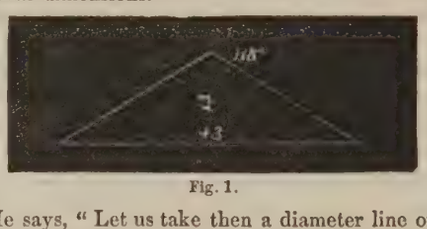

Fig. 1.

He says, "Let us take then a diameter line of 43, and a medium height of 13, and we have here our angle, Fig. 1, 118°, all that the object-glass *can* take in by carefully ascertained dimensions. Thus in this case, from the fact of plain measurement, an aperture beyond 118° is impossible." [And just this is his fatal mistake and assumption. It never *can* be true, except at "open point" "uncovered," and then *this* triangle don't exist!] But Mr. Wenham goes on to say, "Were it merely my purpose to point out errors, I might now stop; but there is no benefit to the community at large unless the relations of cause and effect are investigated," and proceeds to describe the "slit." "If a small stop or narrow slit with knife edges is placed before the object-glass, when the aperture is measured it will cut off all false rays, and confine the image-forming ones to a definite margin. The focus of the object-glass must be exactly in the plane of the front of stop. All rays up to 180° can then reach this point, and consequently all true ones within such an angle will be admitted.

"In this way the angle of Mr. Tolles's one-sixth was measured, . . . tried for angle with the usual sector, still with the lenses at closed point. Instead of 180°, the aperture was at once shown to be the more rational and wholesome angle of 112°, only SIX *degrees* less than the diameter of the lens could possibly admit from the point of focus." [1]

The exact *modus operandi* of the apparatus (slit and objective) in this performance is given in Fig. 2, the basis of which figure is borrowed from Mr. Wenham's article on "Angular Aperture," appearing some two years earlier than his notice of the one-sixth, and his invention of the slit. As he must admit, probably, what he inculcates or sets forth there, it will prove convenient for my purpose to date from that. This is his description of *his* figure, so far as it is made use of here, in Fig. 2.

"Let *a b* represent the maximum working diamter, or actual working surface, of the front lens that is sufficient for the passage of a pencil of rays of 170° from the focal point *c*. By the law of refraction these rays will take the direction *d e* in the body of the front lens." He then goes on to say that if the lens be immersed as to its front surface in Canada balsam (or, of course, any other medium) of the same index of refraction as glass (crown), the rays *d e* will suffer no refraction at the surface *a b* but proceed straight in the direction *d e*, extending the focus to *g*.

Mr. Wenham here speaks, as I shall, of the rays as proceeding from the eye-piece, or a long conjugate focus, *down* through the objective to its focus *c*, in air, or *g*, in balsam (or glass).[2] He adds, "*d e c* must be fixed in direction, then, for the dry lens, and *d e g* for the balsam lens." But in the diagram, Fig. 2, if *g* is the focus, in balsam or glass, of *d* and *e*, then, in case the objective be a combination corrected for the thickest cover it will focus through, *which the one-sixth was*, all the rays in the body of the front lens, between *a b*, will have *direction* straight to *g*. Thus, the ray marked 40° has direction to *g*, the ray in the body of the front marked 38° direction to *g*, the ray 33° in the front direction to *g*, as they necessarily have in this "balsam lens," according to his own showing, for the marginal ray.

From this fixed direction in glass of front lens their direction in air is easily deduced. The central pencil of 10° *in the front* will have its focus in air about at the distance from the front of the shutters forming the slit, which is about two thirds the distance of the balsam focus *g*. By the same undisputed law of refraction, and as Mr. Wenham has drawn that marginal ray, the ray marked 40° within the front lens has emergence into air at an obliquity of 85°, as marked in the diagram, and of course showing an air-angle of 170°.

All the distance from the shutters (the *air* focus of central rays) to *c*, is *aberration*.[3]

Fig. 2.

Now Mr. Wenham particularly specifies, and very properly, that the slit must be in focus. The "balsam" lens, or any other, in air *at closed* (the exact

[1] *The Monthly Microscopical Journal*, London, March, 1874, page 114.

[2] "In this demonstration it is needless to complicate the question by carrying the rays through the entire combination, as we may take them at their final emergence at the longest conjugate focus possible, or just within parallelism; *d e c* must in that case be fixed in direction and position for the dry lens, ... and *d e g* for the balsam lens." (F. H. Wenham, in *Monthly Microscopical Journal*, Nov., 1872, p. 232.

[3] Plainly stated in reply (*Monthly Microscopical Journal* for July, 1874, p. 17) that "this enormous spherical aberration arises at the front plane surface, and for compensation, or correction rather, needs a covering-glass of suitable thickness." In the same journal, August, 1874, p. 114, Mr. Wenham responds that he does "not care to be at the trouble of translating his [my] text for his [my] probable meaning," etc.

case of the one-sixth) *has* no corrected focus in *air*. Only the closely central rays could approach that condition and define the slit. Their focus would be where the shutter is in the figure, very nearly. (The mildly *oblique* pencils passing through the *central* portion of the lens, *but not drawn*, reach and define the *shutter edges*.)

The opening in the shutters is about the breadth Mr. Wenham used. It is drawn to allow his 112° of pencil at least to pass out. With a suitable eye-piece this "slit would exactly trim the field."

It would take a very *wide* slit to include the 85° ray, and a very *wide* eye-piece to include the slit.[1] Every cover-correcting DRY objective has this same terrible "displacement" of the marginal rays.

(To be concluded.)

DR. JOEL E. HENDRICKS AND HIS MATHEMATICAL JOURNAL.

THERE are several mathematical periodicals in Europe, but from some cause it has thus far been impossible to sustain one in this country, no journal of the kind having been continued beyond a year or two. In January, 1874, Dr. Joel E. Hendricks, A. M., commenced the publication of *The Analyst*, and continued it through the year as a monthly journal. *The Analyst* has been highly commended by our best mathematicians as an ably-edited mathematical periodical, and one that is much needed in this country, but the first volume did not quite pay expenses. Dr. Hendricks has concluded to continue it another year as a bi-monthly, hoping that he may be sustained in his effort to establish it on a permanent basis. Each number will contain at least thirty-two 8vo pages, and the price per volume of six numbers is two dollars. Are there not more mathematical readers in this country who are willing to subscribe for and sustain *The Analyst*, so that Dr. Hendricks will at least not lose money in his undertaking?

Dr. Hendricks is now fifty-seven years of age, and the story of his life is a most instructive one. He mastered Bridge's Algebra in seventy hours, and in two weeks he acquired a sufficient knowledge of English grammar to be considered especially proficient in it, by a person who examined him as to his qualification for teaching.

DAVID TROWBRIDGE.

UNUSUAL COMBINATION OF CLOUDS.

ON the 5th of March, 1875, about noon (10 minutes past 12, local time), I saw in the northwestern heavens, at an altitude between 35° and 50°, a remarkable combination of cirri. Fourteen distinct, sharply-defined parallel bands of cirro-stratus, inclined to the horizon at an angle of about 20°, were interlaced with fine, delicate filaments of cirrus, irregularly distributed among and through them, and crossing them at all possible angles, while resting directly upon the cirro-stratus bands were from six to fourteen perfect specimens of cirro-cumuli, the whole combination moving from southwest to northeast with a relative velocity of 3. In the west were cirrus, cirro-stratus, and cirro-cumulus at different elevations, moving with different velocities; but in this meteor they were combined, superimposed, and moving as one body. The meteor disappeared in about twenty minutes, by dissolving.

I called the attention of my brother, A. K. Slade, of Fall River, Mass., who was spending the day with me, to the phenomenon, and remembering that Professor Poëy, in his classifications of clouds, describes the cirro-cumulo-stratus and the cirro-stratocumulus as seen only once, in Cuba, in 1864, we immediately referred to his illustrations, and comparing them with the meteor before our eyes we found that the existing phenomenon was much more brilliant, finely delineated, and beautiful than Poëy's description. Moving along a background of the purest azure, the spectacle was grand and inspiring.

ELISHA SLADE.

SOMERSET, BRISTOL CO., MASS.

[1] "I should have said not less than the crown of your hat."

EDITORIAL NOTES.

CORROSION OF PLATE GLASS BY MUCILAGE. — A correspondent in Newark, N. J., sends us the following, which is of interest to all owners of plate glass: —

"A few weeks since the proprietor of the establishment in which I am employed placed upon the plate glass windows of one of his stores a notice, 'To Let,' using, to secure the paper to the glass, the ordinary mucilage made for commercial use. Ten days after, it was found upon removing the notice that where the mucilage had come in contact with the glass the latter was completely etched, presenting the appearance of *ground* glass. The defacing of the glass was attributed to the presence of acid in the mucilage. It would be well to avoid the use of mucilage for like purposes if such are to be the results."

CONCERNING MILK. — At a recent meeting of the Royal Dublin Society, Professor Cameron read a paper on the chemistry of milk. He stated that the white color and opacity of milk were not due, as was commonly supposed, to the liquid being a fatty emulsion, but to the fact that the fat globules in milk were invested with a caseous solid membrane which reflected light. By appropriate treatment all the fats of butter could be extracted from milk, and still the residue would retain the characteristic appearance of that fluid. The solids in cows' milk never sank below 12 per cent. in town dairy cows, and 11.5 per cent. in farm cows on poor pastures.

"TEMPERED" GLASS. — When we first read in the papers that a Frenchman had discovered a method of "tempering" glass which rendered it so tough that an iron ball could be dropped from a considerable height upon a thin plate of the material without breaking it, we thought it rather a "tough" story, — perhaps one of the scientific "sells" that *Figaro* occasionally perpetrates; but Mr. C. W. Siemens, F. R. S., now reports, on the authority of his brother, who is a glassmaker at Dresden, that the process really effects what has been claimed for it. The glass is simply heated to redness and then cooled in oil, which makes it extremely tough without impairing its transparency. The following is an extract from a French report of some experiments with this tempered glass: A sheet of ordinary glass 6 millimetres (rather less than ¼ in.) in thickness was fixed in a wooden frame and placed on the floor of a room. A brass ball weighing 100 grammes (about 3½ oz.) was then dropped upon it from gradually increasing heights, till it was shattered when the ball fell 24 centimetres (about 9½ in.). A sheet of the new toughened glass only half the thickness (3 mm.) was then substituted, and resisted the falling weight till a height of 575 centimetres had been reached, or nearly 19 ft.

ATOMS.

To exterminate caterpillars on trees, these may be sprinkled with a solution of one part of sulphide of potassium in 500 parts of water; this, it is said, will kill the insects, and do no harm to the trees. — To take wax spots out of cloth or silk, drop spirits of turpentine or alcohol on the spot; then with a sponge rub it gently, repeating the process until the spot disappears. —Ivory may be made ductile so as to be worked into any desired form by soaking it in a solution of pure phosphoric acid; exposure to the air hardens it, but it may be made pliable again by immersion in hot water. — To render screw-holes which have worn loose capable of holding their screws again, plug up the hole with cork, and on driving the screw it will be found to hold as well as ever. — A glue which will resist the action of water is made by boiling one pound of glue in two quarts of skimmed milk. — According to official returns, there are 290,901 licensed dealers in tobacco in Great Britain. — The first hospital for the sick in England was founded at Canterbury by Archbishop Lanfranc in 1070.

QUESTIONS AND ANSWERS.

J. C. W., LANCASTER, PA. "Will you please inform me how I can deodorize coal oil, or kerosene, so as to render it pleasant and agreeable?" This correspondent presumes that we possess important knowledge regarding an important matter. If any chemist has discovered a method by which kerosene oil can be cheaply and effectively deodorized, the discovery is worth to him more than one hundred thousand dollars. It would certainly be a great kindness in us to inform our correspondent just "how to do it," provided we knew.

C. B., BOSTON, MASS. "Is wrought iron durable? Will it not rust and become destroyed sooner than cast iron, when used in connection with heating apparatus?" Wrought iron does not rust or oxidize so rapidly as cast iron, because it is more compact in texture, and excludes oxidizing agents, air and moisture, more effectually. On the surface both are nearly alike affected, but oxidation proceeds slower, after the film of rust is formed, on wrought iron than on cast. Very thin plates of wrought iron, like stove-pipes, are easily destroyed, because the film of rust forms on both surfaces, and the action extends *through*. Increase the plates to the thickness of boiler iron, and the action is arrested before oxidation weakens the iron. Rust does not *pass through* thick plates of wrought iron readily, and steam boilers have stood exposed to air and moisture for years without being materially weakened. We have a steam device in our dwelling which has been in use for *twenty years*. The wrought iron parts are still in good condition, while the cast iron portions have rusted out entirely, and been replaced in some parts *twice*, during that period. Thick plates of wrought iron will outlast those of cast, by double the number of years, at least.

G. W., SOUTH AMBOY, N. J. Zinc linings to refrigerators can hardly be regarded as dangerous, inasmuch as food does not actually come in contact with the metal. The white film often seen upon the zinc linings is oxide of zinc; this should be removed, so that it may not become detached and fall into food placed in the refrigerator.

MRS. A. L. J., BROOKLYN, N. Y. It is possible you may be able to extract the oil from the marble by placing over the spots patches of cloth, and pressing upon them with a hot flat-iron. If the spots are superficial, they can be rubbed off by the use of pulverized pumice-stone.

W. H. B., NEWBURN, VA. Your inquiries respecting methods of cultivating grapes, and other farming matters, you will find answered fully in "Fireside Science," a volume published by the editor of the JOURNAL in 1872. It can be procured by writing to Messrs. Hurd and Houghton, Publishers, Boston or New York.

H. K. H., FAYETTEVILLE, N. C., is answered above.

S. Q., AKRON, OHIO. Water in freezing rejects foreign substances held in it physically or in solution. As you suggest, the water from melted ice, if the ice is carefully selected and melted, is pure enough for pharmaceutical purposes. It is as pure as most of the distilled water sold by chemists.

R. B. H., TALLAHASSEE, FLORIDA. Calcined oyster shells have no greater manurial value than rock lime. If lime is needed upon soils, the burned shells will do very well.

P., SALT LAKE CITY, UTAH. You remark that you are an assayer and troubled with a "bad breath," and that all assayers in your region are troubled in the same way. What connection there may be between your vocation and the "bad breath" we are unable to say. The latter is probably due to derangement of the digestive apparatus, or to decayed teeth. Consult a respectable physician upon the subject. An excellent little book on "The Breath and the Diseases which give it a Fetid Odor," by Dr. J. W. Howe, has been recently published by the Appletons.

G. M. S., NATICK, MASS. When sal-soda is dissolved in hot water, and lime added to the solution, the carbonic acid of the carbonate of soda leaves that substance and goes over to the lime, forming carbonate of lime, or chalk. The soda is thus left in the form of oxide of sodium, or caustic soda. A solution of caustic soda, prepared in this way, is largely used as a "washing fluid," and has powerful detergent qualities. It is not, however, quite safe to use in connection with valuable fabrics.

L. B., BUFFALO, N. Y. There is no practicable method by which rancid butter can be made sweet and palatable, that we are acquainted with.

DR. S. G., NEENAH, WIS. Your statement that a solution of subsulphate of iron is an excellent remedy for burns is corroborated by another physician who writes us upon the subject. The solution should be spread over the burn, so as to exclude air, and in a short time the process of healing is complete. The application, our correspondents state, is painless.

A. B., COLD WATER, MICH. To renew your grape border and bring the vines into bearing again, we recommend the application of wood ashes and bone dust. If you have not these,

take a crowbar and make numerous holes in the border, and fill them with the liquid from the kitchen drain pipe. You can safely apply this liquid often and in large quantities. It will have an excellent effect upon your vines.

C. W. G., CLAREMONT, N. H. Use the rubber cement which is sold by every dealer in rubber goods in large cities.

A. S. N., TOLEDO, OHIO. To remove the tarnish from the brass vessels, employ a weak solution of oxalic acid, and then polish with rotten-stone. See also JOURNAL for February, 1875, page 89.

LITERARY NOTES.

THE APPLETONS have just published *The Histology and Histochemistry of Man*, a treatise on the elements of composition and structure of the human body, by Professor H. Frey, of Zurich, translated from the *fourth* German edition by A. E. J. Barker, Surgeon to the Dublin Hospital, and revised by the author. The rank which the work holds in Germany is shown by the number of editions that have been called for. The late Professor Max Schultze recommended it to his pupils as the best manual on the subject. It is certain that we have nothing of the kind in English that can compare with it for fulness and thoroughness. The American edition forms a handsome octavo of nearly seven hundred pages, with more than six hundred illustrative wood-cuts. It may be found at Mr. James Campbell's, Tremont Street.

Another reprint from the same house is *Scientific London*, by B. H. Becker, an interesting account of the Royal Society, the Royal Institution, the Society of Arts, the Chemical Society, and ten other of the leading scientific associations of London. The history of each is given, with sketches of eminent men who have been actively concerned in them, and their present status and modes of operation. Some of the papers, as that on the Gresham Lectures, are not devoid of humor, and all are very readable.

The *Science Record for* 1875, published by Munn & Co., of the "Scientific American," is a well-edited compendium of scientific progress and discovery during the past year. It is the only illustrated annual of the kind, and the cuts add much to its value. Other commendable features are the references to the authorities from which the matter is taken (which include no less than 157 periodicals, in English, French, and German), and the exhaustive index.

Professor Prescott's *Chemical Examination of Alcoholic Liquors* (Van Nostrand) is as good in its way as his "Organic Analysis," commended a few months ago. It will be found a trustworthy guide in this important branch of practical chemistry.

The latest number of Macmillan's "Nature Series" is Sir John Lubbock's *British Wild Flowers in Relation to Insects*, in which this comparatively new subject is treated in a manner at once learned and popular. It is every way a delightful little book.

Mr. James Campbell has just ready *A New Manual of Physiology*, made up of the lectures delivered by Professor Küss at the University of Strasburg, edited by Dr. M. Duval, of Paris, and translated from the second French edition by Dr. Robt. Amory, formerly professor in the Medical School of Maine. The translator undertook the task because he could find no English text-book "in which the functions of living tissue were closely compared and combined with its texture, or, in other words, a book wherein the relations of physiology to histology were carefully presented." We happen to know that some other medical teachers have felt the same difficulty, and we believe that this new manual will be welcomed as one that meets the want in a good measure, if not completely. The book forms a compact duodecimo of 530 pages, with 150 wood-cuts inserted in the text.

Social Pressure, by Sir Arthur Helps (Roberts Brothers), is virtually another volume of "Friends in Council," and will need no indorsement to those who have enjoyed the genial wisdom of its predecessors in the series. They will only lament that it must be the last. In the essay entitled "Towns may be too Large," and several others, some of the most important problems of sanitary and social science are ably discussed, while lighter themes give a pleasing variety to the volume.

Colonel Higginson's *Young Folks' History of the United States* (Lee & Shepard) is as marked a departure from the common type of American school histories as Green's "Short History of the English People," which has given the author such sudden fame on the other side of the Atlantic. As a contemporary has said, "The book is so written that every child old enough to read history at all will understand and like it, and persons of the fullest information and purest taste will admire it." We are glad to see that it is already being adopted in the schools.

Parlor Recreations (Osgood & Co.) is a little book that will be found very helpful in the direction suggested by its title. *A Passionate Pilgrim and other Tales*, by Henry James, Jr. (same publishers), is not at all in the ordinary vein of fictitious literature, and will gratify the most refined and intellectual taste. Noyes, Holmes, & Co. have all these books.

It has been stated in some of the papers that the *International Review* was to be discontinued, but the March number indicates no lack of vigor, being one of the best that has appeared. If the Review is not sustained, it will not be because it is unworthy of a generous support. It will be borne in mind that we furnish it *with the* JOURNAL at the regular subscription price, $5.00.

Medicine and Pharmacy.

AMERICAN PHARMACEUTICAL ASSOCIATION.

THE volume of Proceedings of this association at its twenty-second meeting, held at Louisville, Ky., September, 1874, has been received, and its contents are creditable to the body whose transactions it records.

Professor Maisch, the able and indefatigable secretary, has done his part exceedingly well, and the long report on the progress of pharmacy by C. Lewis Diehl, affords evidence of great ability and industry on the part of the author. This report covers more than three hundred pages, and is a full *résumé* of the progress which has been made in pharmacy and chemistry during the years 1872 and 1873. Mr. I. Bartlett Patten, the well-known druggist of this city, presents a very interesting and sensible paper upon "The Name Apothecary." We shall make some extracts from this paper at another time. "Cleanliness as a Pharmaceutical Virtue" is the title of an important paper by J. M. Ayers, of St. Louis. This paper contains suggestions which should be read and pondered by every apothecary in the country. Cleanliness, order, method, are indispensable in all well-conducted drug stores, and students and assistants should be early drilled in these requisites. "Assistant Pharmacists," a paper by Paul Balluff, is a timely contribution upon the subject of which it treats. The papers and reports in the volume are well written, accurate, and sensible, with one exception.

The document furnished by Albert E. Ebert, of Chicago, on page 448, ought not to have had a place in the Proceedings; indeed, it ought not to have been permitted to be read in the Louisville meeting. In this view we are sustained by a large number of the oldest and most respected members of the body. The style is very objectionable and personal, and when it is known that scarcely one of the statements is true, mortification and regret at its appearance must be felt by every right-minded member of the association. To prevent a repetition of this offence in the future meetings, we would suggest the adoption of a rule at the next meeting like that of the American Association for the Advancement of Science, the American Academy, and the Society of Arts, which requires those who propose papers to place them in the hands of a supervising committee before they are read. In this way, the unworthy papers of weak or designing members are sifted out, and refused presentation. If Professor Maisch, Dr. Squibb, or Dr. Diehl had had this document under notice in committee it would have been promptly suppressed.

The American Pharmaceutical Association is a dignified and scientific body; its members for the most part are men of reading, culture, and of considerable scientific attainments. Its records are permanent records; they are not only read and held for reference by learned societies and associations in this country, but they go abroad in exchange for those of similar societies, on the other side of the water. It is important, therefore, that its records should be well considered, and no charlatan should be allowed to steal in and, by blunders or exhibition of personal spite, jeopardize the good name and reputation of the association. In conversation with Professor Attfield at the rooms of the Pharmaceutical Society in London two years ago, he spoke in terms of high appreciation of the American society and of its published papers, and we should regret to lose the respect of this gentleman and others no less distinguished.

It is due to Professor Maisch to say that he did everything he could, after fully comprehending the nature of the paper in question, to place it in the right light before the readers of the volume. He kindly added in an appendix some explanatory remarks, and a note from the parties assailed, which vindicates them from the charges so unjustly made.

The next meeting of the association will be held in this city in September, 1875, and we predict for the members, who will assemble from all parts of the country, a pleasant and profitable meeting. Steps have already been taken by the druggists of the city, and others interested in the objects of the association, towards preparing for the meeting, and we are certain the well-known hospitality and courtesy of Boston will be manifested in every possible way during the sessions. We hope to see a large attendance.

ASTHENIC DISEASE AND FLOUR.

BY E. CUTTER, M. D.

May it not be possible that the use of flour is one cause of the change in the type of disease from strong (sthenic) to weak (asthenic)?

That the type of disease has changed is a fact acknowledged by the regular profession of medicine; and this change consists in diseases assuming that prostrating type and character which requires stimulating and supporting treatment of every kind. Patients with certain diseases formerly required, bore, and yielded to reducing treatment, such as general depletion and active purgation; but now, when affected similarly, they are found not to bear the same measures without serious depression of the vital forces. Occasionally we meet with patients who do bear the old treatment, but they are of such apparent robustness and vigor as to make the indication very plain; and it is possible that the profession have swung too far to the other extreme. But the object here is to discuss the relations of a diet of flour to a weakened condition of system, which renders diseases of a low, inactive character more readily prevalent. Allow us to make a suggestion. Suppose, for instance, our farmers should manure their crops for one year with only one quarter of the fertilizers ordinarily deemed necessary; suppose they should do this, not for one year only, but for forty years: what sort of vegetation or crops would they have? Why, it is clear that the vegetation as a general thing would be stinted, the crops small and ill-developed, the vitality of the plants feeble; and instead of pruning, reducing, and cutting down, measures of a "supporting" character would have to be adopted, as it is doubtful whether the plants would stand up of themselves. Something cannot be made out of nothing — *ex nihilo nihil fit* — is an ancient motto. Now apply this principle to mankind; let them feed upon food (as they have done) for forty years or more, which contains one fourth of the mineral food which they consumed in the days of coarse bread, made out of whole wheat, corn, rye, barley, and oat meal; would you not expect a change in the character of the tissues and fluids

of their bodies? As plants would show degeneration, feebleness, and stinted development, would you not expect the same result in animals? The doctrine of the indispensableness of mineral salts to vegetable growths is of modern origin. We wish to go further, and apply it to animal tissues likewise, and we feel assured that when the days of fine flour are past there will be the old-fashioned type of disease back again, because the bodies of people will obtain their full modicum of mineral salts. Indeed, in remote rural districts, where the old ways of living are practised, the necessity for depleting measures is said to be as strong as ever.

Take our typhoid fevers, our scarlet fevers, diphtherias, measles, small-pox, choleras, dysenteries, cholera-infantums, and consumptions, — nearly all get iron, quinine, beef-tea, wine, and stimulants; and rightly, too, in most cases. Some of these complaints are thought by the best minds in the medical profession to be of a vegetable, parasitic nature, communicated to man from decaying vegetable matter. It looks now, more than ever, as if this is so. Should it be proved to be so without a doubt, then as these smuts, rusts, ergots, mildews, etc., prey upon the vegetables of impaired vitality, so it will be seen that mankind, weakened by living upon food containing but twenty-five per cent. of the normal amount of mineral salts, has fallen an easy prey to diseases of a low type, and typhoid and parasitic character. This suggestion of the connection of the use of flour with the present asthenic type of disease is entirely our own, and no one but ourself is responsible for it.

And here we would not press the parallel too far, as people commonly eat animal and other vegetable food than flour. We admit it, but how small a proportion of animal food enters into the diet of common people! As Dr. Salisbury says, we are two thirds animal and one third vegetable in our constitution. Yet our food is the other way: we eat about seven eighths of vegetable food and one eighth animal. It is safe to assume that among civilized people to-day, the diet is mainly bread, and that bread is flour-bread; so that the use of flour as food is so large as not to invalidate the general truth of our statement. It is fortunate we do have other food, for if confined to flour-bread alone we should probably become so enfeebled as to die like Magendie's dog, in forty days. It is desired to suggest whether a diet of flour, if not complete, would not cause such a degree of weakened tissues and fluids as to perceptibly diminish the power to resist disease, so that in the conflict with it, flour-eating patients are found to be the "under dog in the fight," needing tonics, stimulants, and supporting treatment, to come out the "upper dog."

In this connection it is proper to remark that infant mortality (in 1874, in the town of Woburn, fifty-six children under five years of age died; total mortality, one hundred and fifty-five) has been in part attributed to the use of flour. It is probable that it is so, as development during these years of infancy is so rapid that it demands large amounts of building material, both for growth and for the nerve forces that direct, govern, control, and shape that growth. If plants were fed on one fourth the normal amount of manure, it would not surprise us to have three fourths of them die (other things being equal) when beset by droughts, insects, and parasites that flourish upon weakened tissues, animal or vegetable.

FEEDING BABIES WITH STARCH.

There are certain very simple principles in dietetics which many people are as "slow to learn" as some of the equally elementary laws of hygiene to which we referred a month ago. For instance, they cannot get it through their skulls that starch, though a valuable article of food in combination with other things that supplement its deficiencies, cannot of itself furnish all the nutriment needed by a growing infant. This is clearly and pointedly "put" by Dr. Henry MacCormac, in the London *Sanitary Record*, as follows: —

The nurse or the fond mother boils a quantity of some starchy matter, previously well blended with the spoon, and, pleased with its bland flavor and slab aspect, administers it forthwith to her darling baby. She wonders why the baby does not thrive better, but is unaware that the very commonest and coarsest food would, in all essentials, be preferable. Arrowroot, any kind of starch, corn-flour so-named, but in fact, starch, is inferior in all respects to well boiled oatmeal porridge or groat gruel. It cannot compare with wheaten meal, or even rice porridge; it is inferior to boiled barley or any of the preparations of Indian corn, and also to the common potato. What beautiful children have I not seen, again and again, in Irish cabins, whose food was the potato, with possibly a little oatmeal porridge and buttermilk. The coarsest, plainest substance, if only coupled with fresh air by night, plenty of out-door exercise by day, cleanliness, and warmth, is preferable to the richest fare without.

Starches of any kind are bereft of the ingredients essential to animal life. In strictness, a portion of those ingredients is present; but where are the phosphates, for example, without which the bones cannot be framed? If it were not for the milk, which haply proves the vehicle of the starch or fecula, the infant would inevitably perish. . . . Once for all, starch food, though it may answer very well as food for adults as a portion of mixed diet, is quite unfit, *per se*, as an exclusive infant diet. It is not worth belly room, and ought invariably to give place to the foods I have named.

TREATMENT OF SCARLATINA.

Hyposulphites and Carbolic Acid in Scarlatina. — Dr. Bland, in the *Transactions of the Medical Society of the State of Pennsylvania*, says: "In the treatment of scarlatina anginosa, I must again renew my indorsement of the internal administration of the hyposulphites and carbolic acid. The results obtained in this disease with the above remedies are unprecedented, and give every evidence to warrant their continued use. I recently treated seven cases in one family, four of whom had severe throat-ulcerations. The topical application of carbolic acid and glycerine to the inside of the throat, the hyposulphite of soda internally, with good nutritious diet and febrifuge mixture as required, was the treatment employed, and in eight days the patients were all well. A number of my colleagues have tried the foregoing remedies, and give them their unqualified indorsement."

The Wet Sheet in Scarlatina. — Dr. John Taylor, of Liverpool, writes to the London *Lancet* as follows: "My plan of procedure is to immerse a night-gown, slit up at the front, in hot water (half a pint to a pint), pure or medicated with a drachm or two drachms of tincture of capsicum, or in the infusion of three or four pods, or in mustard-water, the clear supernatant fluid from a table-spoonful of mustard to a pint of water; extending the gown over the feet by means of a towel immersed in the same fluid; both to be well wrung out and suddenly applied, and the patient quickly packed in two blankets previously placed on the adjoining sofa or bed; another blanket or two pillows or an eider-down quilt covering all. Modern experience has witnessed the amazing relief procurable from the wet sheet, in its simple form, in pyrexial and glandular disorders, and from the medicated form in the zymotic and spasmodic affections. In stridulous croup, for instance, I have seen the mustard sheet act magically after other means more orthodox had failed. Its power is also potential in diphtheria simulating croup, and, in strong doses, in inflammatory croup, sometimes averting the impending tracheotomy knife."

SANITARY NOTES.

A Disinfecting Cologne. — A correspondent of the *Philadelphia Medical Times* says: "During the prevalence of small-pox in 1871 and 1872, I had frequently been requested by my friends to prepare a cologne possessing disinfecting properties. I found in preparing such an article that upon mixing hydrate of chloral and carbolic acid the disagreeable smell of the latter was almost entirely removed, and upon adding these to spirits of lavender or ordinary cologne-water, a not unpleasant odorous volatile solution resulted. This, used with an atomizer, readily saturated an ordinary-sized apartment with the vapor of these most valuable antiseptics."

"The Cottage Homes of England!" — An English exchange states that the medical officer of the district of Chisledon made a special report to the Board of Guardians last week, in reference to an application for relief to a woman who had just been confined. The report was as follows: "Thomas May, aged 45, works for Mr. C——, average wages 10s. a week. Mary Ann, his wife, aged 47; Edward, aged 18; William, aged 16; Elizabeth, aged 13; Emily, aged 11; Mary Ann, aged 8; Tom, aged 6; Rose, aged 5; John, aged 3; Andrew, aged 2; infant last Saturday. The family all sleep in one room, 16 feet long by 10 feet wide. There are three beds in the room, but no partition or curtain of any kind."

The Diseases of the Rich. — While typhus and many other epidemic diseases desolate the hovels of the poor, typhoid fever would appear to be in a special manner the scourge of the rich, repletion being thus as fatal in its effects as starvation. It would almost seem, says the London *Lancet*, speaking of the latter, as if the habits of life, and the varied, rich, and plentiful diet of the more opulent classes induced a condition of susceptibility to this disease. Nature is no respecter of persons; and when three members of the royal family have succumbed, or been brought to death's door by this pest, which almost seems to take by preference men and women of position and wealth, it is high time that these classes should consider whether there is not something in their mode of living which requires amendment, and whether sanitary improvement, like charity, might not well be begun at home. Something of this liability to typhoid infection is doubtless also owing to the unsanitary state of ancestral mansions, especially as regards drainage and ventilation. Indeed, in many even of the newer neighborhoods of towns it is to be feared that evils of this sort lurk unknown and undreaded, either in defective drains carelessly or imperfectly connected with the main sewerage, or, as has been recently pointed out by a contemporary, through streets having been laid out on the festering area of rubbish heaps. At all events, epidemics may safely be accepted as punishments inflicted by

Nature for breaches of her laws; and it is the duty, no less than the interest, of those who suffer by them to investigate their origin, and amend their lives accordingly.

MEDICAL MEMORANDA.

A Tribute to American Surgery. — Professor John Eric Erichsen, of University College Hospital, London, upon his return home after a short visit to this country, gave an address on American surgery, in which he says: "Surgery in the United States certainly stands at a very high level of excellence. The hospital surgeons throughout the country have struck me as being alike practical, progressive, and learned in a very high degree. In practical skill and aptitude for mechanical appliances of all kinds they are certainly excelled by no class of practitioners in any country. They are thoroughly up to modern surgery in its most progressive forms, and I have never met with any class of men who are so well read and so perfectly acquainted with all that is done in their profession outside their own country. It would be a great injustice to American surgeons for it to be supposed that surgical skill is confined to the large cities or to the few. On the contrary, I know no country in which, so far as it is possible to judge from contemporary medical literature, there is so widely diffused a high standard of operative skill as in the country districts and more remote provinces of the United States."

How Long it Takes to Wink. — We have before referred in the Journal to Exner's interesting researches concerning the time taken for certain forms of nerve action. He has recently been making experiments upon winking. His apparatus consisted of a very light lever of straw, terminated at one end by a bristle which was applied to the eyelid, the other end being connected with the usual contrivance for exactly registering the beginning of muscular contraction. The stimulus was an electric spark, applied in two ways: by passing in front of the eye, and thus acting on the optic nerve; or by exciting the nerve of sensation by striking directly on the cornea. He found the interval between the spark and the beginning of motion (that is, the time occupied in the transmission and reflection of the sensation, with the period of latent excitation in the muscle) to vary with the intensity of the stimulus, from about one eighteenth to one twenty-fourth of a second, the stronger the spark the quicker being the action. The period of latent excitation of muscle in man has never been precisely determined. Dr. Exner estimated it at about a hundredth part of a second, which would reduce the time required for the purely reflexive part of the act of winking to about one twenty-second of a second for a weak impression, and one twenty-seventh of a second for a stronger stimulus.

ZINC POISONING.

A distinguished physician residing in Portland, Me., sends us the following report upon some cases of zinc poisoning in his own family: —

I have lately reported before our County Medical Society seven cases of poisoning from the use of galvanized iron water-pipe, which strongly confirm the views which you have so long advocated.

The chief value of my report was the opportunity afforded of getting at the symptoms which *characterize* this kind of poisoning, my own family, including myself, being the sufferers; for throughout the whole family of seven members, each one exhibited the same symptoms with no variation except in degree of intensity, and that in exact proportion to the amount of the poisoned water used.

The children, whose principal drink was milk, suffered slightly in comparison with the older members. Our mouths began to be sore about thirty days after we began to drink the water, on which point we are quite positive, as we had just moved into the house.

In investigating the cause of these symptoms, I discovered that the cook had habitually drawn hot water from the copper tank for general cooking purposes and for making tea and coffee, as being easier than the use of the teakettle. Not knowing any danger, she did not allow the water which had been standing in the pipes to run off before drawing for use, as is commonly done; so the family got the full effects of all the zinc dissolved throughout the surface of a pipe seventy-five feet long, and that in a concentrated form from prolonged boiling. The water was examined by our State Assayer and found to be highly charged with the oxide of zinc; no trace of lead, copper, or other source of poison being discovered. As soon as the use of the water was discontinued, all the symptoms of poisoning rapidly disappeared.

Nearly two months after I had entirely recovered, I again tried drinking the same water, in order to make the *experimentum crucis*. The same symptoms began to repeat themselves, and the characteristic sore mouth caused me to desist.

The earliest symptom from which we suffered was the appearance of minute "told-a-lie" blisters on the tongue, followed by an inflammatory redness and burning heat of the whole mouth. Day by day the inflammation grew worse; the mucous membrane was vividly reddened and painfully sensitive. The color was deeper along the edge of the gums, which looked spongy and bled easily. The roof of the mouth was overspread with superficial crimson ulcers, round or nearly so, varying in size from two to three lines in diameter and extremely sensitive to acids or hot drinks. Two days later all the symptoms became greatly aggravated. The mucous membrane of the mouth was puffy and burning hot; the tongue stiff, sore, and swollen, seeming to the patient twice its natural size, inflexible and unmanageable in eating or talking. Dysphagia was so great that nothing could be swallowed except cold milk, which was exceedingly grateful. The patches of ulceration had enlarged, the teeth were sore and loose, and there was every appearance of salivation. The roof of the mouth "ached like a rising;" the antra of Highmore felt painfully big; the Schneiderian membrane ached incessantly; the head had a dull throb; the pulse quickened; chilly sensations followed flashes of heat, and the patient went to bed, thoroughly used up. The disease was now at its height, on the tenth day from its outset. Under a milk diet the symptoms gradually improved, and at the end of a week the distressing features of the case had disappeared. In all the adults a metallic taste was very noticeable, and in each case the crimson patches of ulceration appeared in the roof of the mouth. In three members of the family only did the disease go on to salivation. There was neither constipation nor diarrhœa, colic nor muscular pains. Instead of the blue line edging the gums, as in poisoning by lead, we invariably had a crimson border of the same color as the ulcerations in the roof of the mouth.

REMEDY FOR DIPHTHERIA.

The readers of the Journal of Chemistry will find the following combination excellent in diphtheria: —

Cincho-quinine, Potassic chlorate	āā 3 ij.

M. et fiat pulv. xij.

S. Give one powder every four (4) hours in a drink of water.

It is excellent. Luigi G. Doane, M. D.,
Dep't Public Charities and Correction, New York City.

SELECT GERMAN FORMULÆ.

Aromatic Vinegar. — This and the subjoined formulæ from the German Pharmacopœia are selected from a large number commended by the London *Chemist and Druggist*. For Acetum aromaticum, or *Aromatischer essig*, take of

Oil of rosemary	1 part.
Oil of juniper	1 "
Oil of lemon	1 "
Oil of thyme	2 parts.
Oil of cloves	5 "
Tincture of cinnamon	100 "
Aromatic tincture	50 "
Diluted acetic acid	200 "
Distilled water	1000 "

Mix, and keep for three days in a cool place, then filter.

It should be a clear, brownish-red liquid, of an agreeably sour and aromatic odor.

Aromatic Acetic Acid. — For Acidum aceticum aromaticum, or *Gewürzhafte essigsäure*, take of

Oil of cloves	9 parts.
Oil of lavender	6 "
Oil of lemon	6 "
Oil of bergamot	3 "
Oil of thyme	3 "
Oil of cinnamon	1 part.

Dissolve, by agitation, in

Acetic acid	25 parts.

It forms a clear, brownish-yellow liquid.

Aromatic Water. — For Aqua aromatica, or *Schlagwasser*, take of

Sage leaves	4 parts.
Rosemary leaves	2 "
Peppermint	2 "
Lavender flowers	2 "
Fennel seed	1 part.
Cassia bark	1 "
Alcohol	26 parts.
Common water	130 "

Let the cut and bruised ingredients macerate for twenty-four hours, then

Distil off	72 parts.

It should have a strongly aromatic odor. It is turbid.

Marshmallow Paste. — For Pasta gummosa, or *Gummipasta*, take of

Gum Arabic	200 parts.
White sugar	200 "

Dissolve them in

Cold distilled water	600 parts.

Allow the liquid to settle, strain from the impurities, and evaporate it in a copper kettle, placed in a steam-bath, to the consistence of honey, while stirring with a wooden spatula. Then add of

Fresh white of eggs	150 parts,

previously beaten to a thick froth. Continue the stirring, while evaporating the paste with a gentle heat, until it drops with some difficulty from the spatula in motion. Finally, having added

Oleosaccharate of neroli [*see below*]	1 part,

pour the mass into paper capsules, and dry it in a warm place. Then remove from the capsules, and cut it into strips, and preserve it in a dry place.

Liquorice Paste. — For Pasta liquiritiæ, or *Süssholzpasta*, take of

Liquorice root, cut	1 part.

Pour upon it

Distilled water	20 parts.

Macerate for twelve hours, then strain and filter, and, having diluted the liquid with

Distilled water	10 parts,

add, and dissolve

Gum Arabic, previously washed with water	15 parts.
White sugar	9 "

Oleosaccharates. — To prepare Elæosacchara, or *Oelzucker*, take of

Best white sugar, powdered	2 grammes.
Any of the essential oils	1 drop.

Mix them.

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Familiar Science.

THE CHEMISTRY OF OUR FOOD.

I.

IN the JOURNAL for March, 1874, it was explained how "a day's work" — including both the "external" work, or that performed in labor or active exercise, and the "internal" work, or that done by the organs of circulation, respiration, digestion, and other vital processes — may be measured in foot-pounds; and in the number for April, 1874, under the heading of "Food and Work," the relations between this exertion of force and the source of that force, or the food we eat, were briefly considered. In the latter article we referred to the estimates that have been made of the quantity and kinds of food required for a mere "subsistence diet," or what will barely sustain life, and for a "working diet," or what a laboring man needs. It was intimated that these "dietaries" would be more fully treated at another time, in connection with the subject of the classification of foods; and this is the topic that first claims our attention in considering the *chemistry* of foods.

"The Chemistry of the Human Body" was the theme of an earlier article than those mentioned above (reprinted in the volume entitled "Fireside Science," published by Hurd and Houghton), in which the elementary substances that enter into the composition of the body, and their average proportions by weight, were concisely stated. Chief among these, in respect to quantity, were the four great elements, oxygen, hydrogen, nitrogen, and carbon, sometimes called "organogens" (organ-formers), from the prominent part they play in the organic world. These make up full 97 per cent. of the weight of the body; but the other 3 per cent. includes the phosphorus and calcium of the bones (without which the body would almost literally become "a few pailfuls of water with a few salts dissolved in it"), the iron of the blood, and the sulphur, chlorine, sodium, and half-dozen other elements, which, though present in amounts ranging from about two ounces down to two *grains*, are none the less essential as constituents of the complex whole. All these elements must be supplied to the body by the food we eat.

An obvious division of foods is into organic and inorganic; that is, into compounds produced by the agency of life, and elements or compounds from the mineral kingdom. The bulk of our food, properly so called, belongs to the former; the water we drink and various salts make up the latter.

The organic division may be subdivided into the nitrogenous and the non-nitrogenous; the former containing all four of the "organogens," the latter all but the nitrogen. Liebig considered this not merely a convenient chemical classification, but an important physiological one. Nitrogen is an essential ingredient in the muscular and other tissues of the body, and he regarded the nitrogenous principles in food as destined for the growth and maintenance of the body; while the non-nitrogenous compounds, he thought, were intended only to be oxidized for the production of heat. The former built and repaired the structure, the latter furnished the fuel to warm it. The theory was a very neat and simple one, and was generally accepted by physiologists until more careful investigations into the relations of food and work disproved it. As the error is hardly yet eliminated from school text-books and popular works on physiology, it may be worth while to refer briefly to the facts and arguments that have refuted it.

Of course the tissues must get their nitrogen from nitrogenous substances, but these substances also furnish heat. After the nitrogen has been taken from them in the tissue-forming process, there is ample evidence that the remaining non-nitrogenous compound is appropriated to the production of heat. In other words, the nitrogenous foods, instead of being limited to one of these purposes, really subserve both of them.

On the other hand, there can be no doubt that non-nitrogenous principles, like fat, though they cannot furnish nitrogen for the formation of muscular tissue, play an important part in the production of muscular force. The modern doctrine of the conversion of energy teaches that heat may be converted into mechanical force, as in the steam-engine. The same thing unquestionably takes place in the body. The oxidation or burning of fat furnishes power for the muscular machinery, as the oxidation or burning of coal furnishes power for the engine. This is no mere inference from analogy, but has been demonstrated by a variety of experiments. According to Liebig's theory, the muscle is worn out by its action, a portion of its tissue being disintegrated or destroyed, and the nitrogen is eliminated in the form of urea. The amount of urea excreted ought then to furnish a measure of the muscular disintegration, or of the work done. Hard labor should increase the amount, rest should diminish it. But experiment shows that this is not the case. Pettenkofer found that the urea excreted by a man in a day of hard labor was no greater than in a day of absolute rest, the food taken on the two days being the same. But the elimination of *carbonic acid* during the day of work was much greater than during the day of rest. What did this show? That the oxidation of *carbon* was increased, though that of nitrogen was not; in other words, that muscular work is due to the former process, not the latter.

The experiments of Fick and Wislicenus prove the same thing in a different way. These two *savants*, in August, 1866, made the ascent of the Faulhorn, in Switzerland, "on an empty stomach," so far as nitrogenized food was concerned. For seventeen hours before the journey they ate nothing but cakes made of starch, fat, and sugar. During the ascent (which was almost exactly equivalent to climbing Mt. Washington from the Glen, the height of the Faulhorn above their starting-point being 6417 feet) they took only the same kind of food, but accomplished the journey without fatigue. "This could hardly have been the case," to use their own words, "if our muscular force had not been sustained by the non-nitrogenous food of which we partook." The excretion of urea during the work was found to be *less* than for an equivalent time before or after, the several amounts being very nearly the same for both men. Calculation showed that the excretion of urea due to the work they had done indicated the destruction of 575 and 555.5 grains of muscle, respectively. But the work done, measured in foot-pounds, was much greater than the oxidation of this amount of muscle would accomplish. In the case of Fick, only 498,525 foot-pounds were accounted for, out of 933,746, or, adding the internal work, 1,154,714; and in the case of Wislicenus, only 481,618 out of 1,074,931 or 1,332,727 foot-pounds. The large remainder of force was probably due to the oxidation of carbon.

Our limits forbid any description of interesting experiments by Dr. Parkes, Dr. E. Smith, and others, which furnished results essentially similar to those already noted. Dr. Smith showed that the amount of carbonic acid exhaled was in exact proportion to the amount of work done, ranging from 293 grains per hour during sleep to 2926 grains per hour in working at the treadmill. While walking two miles an hour it was 1088 grains; walking three miles an hour, 1552 grains; and so on.

It is impossible to ascertain by experiment whether force is produced by the oxidation of the hydrogen which is associated with the carbon in foods, but this is probable from analogy.

We cannot better close this part of our subject than by the following apt illustration from Fick and Wislicenus: —

"A bundle of muscle-fibres is a kind of machine, consisting of albuminous [nitrogenized] material, just as a steam-engine is made of steel, iron, brass, etc. Now, as in the steam-engine coal is burnt in order to produce force, so in the muscular machine, fats, or hydrocarbons, are burned for the same purpose. And just as the constructive material of the engine (iron, etc.) is worn away and oxidized, the constructive material of the muscle is worn away, and this wearing away is the source of the nitrogenous constituents of the urine. This theory explains why, during muscular exertion, the excretion of urea is little or not at all increased, while that of carbonic acid is enormously augmented; for, in a steam-engine moderately fired and ready for use, the oxidation of iron, etc., would go on quite equably, and would not be much increased by the more rapid firing necessary for working, but much more coal would be burnt when it was at work than when it was standing idle."

HOW TO REMOVE SPOTS AND STAINS FROM WOVEN FABRICS.

Taking out grease and other spots from clothes is an application of chemistry which has a practical interest for everybody. It demands a certain acquaintance with solvents and reagents, even though we may not understand the laws of chemical affinity on which their action depends. The general principle is the applying to the spot a substance which has a stronger affinity for the matter composing it than this has for the cloth, and which shall render it soluble in some liquid so that it can be washed out. At the same time it must be something that will not injure the texture of the fabric or change its color. The practical hints we shall give are condensed from a variety of foreign sources.

The best substances for removing grease or oil are: 1. Soap. 2. Chalk, fuller's-earth, steatite or "French chalk." These should be merely diffused through a little water to form a thin paste, which is spread upon the spot, allowed to dry, and then brushed out. 3. Ox-gall and yolk of egg, which have the property of dissolving fatty bodies without affecting perceptibly the texture or colors of cloth. The ox-gall should be purified, to prevent its greenish tint from degrading the brilliancy of dyed stuffs, or the purity of whites. Thus prepared it is the most effective of all substances known for removing this kind of stains, especially from woollen cloths. It is to be diffused through its own bulk of water, applied to the spots, rubbed well into them with the hands till they disappear, after which the stuff is to be washed with soft water. 4. The volatile oil of turpentine. This will take out only recent stains; for which purpose it ought to be previously purified by distillation over quicklime.

An earthy compound for removing grease spots is made as follows: Take fuller's-earth, free it from all gritty matter by elutriation with water; mix with half a pound of the earth, so prepared, half a pound of soda, as much soap, and eight yolks of eggs well beaten up with half a pound of purified ox-gall. The whole must be carefully triturated upon a porphyry slab; the soda with the soap in the same manner as colors are ground, mixing in gradually the eggs and the ox-gall previously beaten together. Incorporate next the soft earth by slow degrees, till a uniform thick paste be formed, which should be made into balls or cakes of a convenient size, and laid out to dry. A little of this detergent being scraped off with a knife, made into a paste with water, and applied to the stain, will remove it.

Tar and pitch produce stains easily removed by successive applications of spirits of turpentine, coal-tar naphtha, and benzine. If they are very old and hard, it is well to soften them by lightly rubbing with a pledget of wool dipped in good olive-oil. The softened mass will then easily yield to the action of the other solvents. Resins, varnishes, and sealing-wax may be removed by warming and applying strong alcohol. Care must always be taken that, in rubbing the material to remove the stains, the friction shall be applied the way of the stuff, and not indifferently backwards and forwards.

Most fruits yield juices which, owing to the acid they contain, permanently injure the tone of the dye; but the greater part may be removed without leaving a stain, if the spot be rinsed in cold water in which a few drops of aqua ammoniæ have been placed, before the spot has dried. Wine stains on white materials may be removed by rinsing with cold water, applying locally a weak solution of chloride of lime, and again rinsing in an abundance of water. Some fruit stains yield only to soaping with the hand, followed by fumigation with sulphurous acid; but the latter process is inadmissible with certain colored stuffs. If delicate colors are injured by soapy or alkaline matters, the stains must be treated with colorless vinegar of moderate strength.

Fresh ink and the soluble salts of iron produce stains which, if allowed to dry, and especially if afterwards the material has been washed, are difficult to extract without injury to the ground. When fresh, such stains yield rapidly to a treatment with moistened cream of tartar, aided by a little friction, if the material or color is delicate. If the ground be white, oxalic acid, employed in the form of a concentrated aqueous solution, will effectually remove fresh iron stains. Acids produce red or other stains on the vegetable colors, except indigo. If the acid has not been strong enough to destroy the material, and the stains are fresh, the color may generally be restored by repeated soakings in dilute liquor ammonia, applied as locally as possible. Photographers frequently stain their clothes with nitrate of silver. The immediate and repeated application of a very weak solution of cyanide of potassium (accompanied by thorough rinsings in clean water) will generally remove these without injury to the colors.

THE SCIENCE OF ADULTERATION.

BY S. P. SHARPLES, STATE ASSAYER.

IV.

In the words of the Rev. Mr. Ingham's double, "there has been so much said, and, on the whole, so well said" upon the subject of adulteration of milk, that it seems almost useless to say more. But this is a branch of our subject that is so thoroughly well carried on that it deserves at least a passing notice.

Milk is a fluid that is popularly supposed to be furnished by the cow. The article furnished by the living cow is undoubtedly the basis of the article generally sold, but the cow with the iron tail is often a most important adjunct to the milk-dealer's dairy. The process of this adulteration seems to be pretty uniform the world over, and most persons supplied with "milkman's milk" would no doubt often willingly imitate the man's example who carried two pitchers to the dealer, and requested him to put the water into one and the milk into the other, as he could mix them himself. In the vicinity of Boston the milk law is very well enforced by the inspectors, and the police judges generally are willing and even anxious to assist these officers so far as it lies in their power. The standard adopted here is 12.5 per cent. by weight of solids in the milk, or 7.5 per cent. of curd. The latter is estimated by adding two or three drops of acetic acid to the milk, and then gently heating it until it curdles, avoiding too high a temperature, which breaks up the curd and renders it difficult to filter. The filtrate should be entirely clear, and is generally of a faint yellow color. The curd is collected on a filter which has been dried and weighed, and is dried at 100° C. until it ceases to lose weight. The milk should also give at least 8 per cent. of cream.

The specific gravity is relied upon in making seizures of suspected milk, any sample falling much below 1.030 being taken and submitted to the chemist for analysis. A variation from the above standards of one per cent. in the solids and half of one per cent. in the curds is allowed; or in other words, if the solids do not fall below 11.5 or the curd below 7 per cent., the case is dropped. The milk-dealers in the course of time have become as familiar with the standards as the inspectors, and they understand fully how to evade the officers. If the milk stands at 1.030 they are in no danger, provided it does not look too blue. The law says that it shall be unskimmed.

Now it is well known that when pure milk is allowed to stand for some hours a sort of thick yellowish scum rises to the top. The milkmen dislike the looks of this, so they carefully remove it. Some of it is used for making butter, and another portion is sold to the ice-cream makers. The milk when the cream is removed is too dense, marking perhaps 1.036 to 1.040 instead of 1.030. This high specific gravity would lead to the suspicion that it had been skimmed, so water is added to bring it down to the proper point. If it looks too blue, some coloring matter is added. After considerable inquiry I have succeeded in getting a sample of this article. A friend discovered the place where it was supplied, and obtained some of it. It is the same article that is used in coloring brandy and whiskey, and it was handed to him with the remark, "This is not quite as fine an article as is used in New York, but we sell lots of it to the milkmen." It is essentially a strong solution of burnt sugar or caramel. Soy also is said to be used for the same purpose.

A very common method of tampering with milk is to allow the night's milk to stand until morning, skim it, and then mix night's and morning's milk together, and add the proper amount of water and coloring matter. It is very difficult to detect this adulteration, especially if the milk is a rich one to start with; and the milkman is a gainer by the amount of cream removed.

Butter when high is very apt to be prepared for the market. A great deal of that sold is excessively salted, as much as possible of the buttermilk being left in it. In England frequent complaint is made of its being watered.

Since the introduction of oleomargarine this article is said to be very extensively used to mix with genuine butter. A quantity of the tallow oil, which must be perfectly sweet and free from taste or odor, is melted at as low a temperature as possible and poured into the churn, the cream having been previously placed in it. The churning is then proceeded with as usual, a little annotto being added to help the color. The result is double the amount of butter from the same amount of cream, and the butter is very difficult to distinguish from the genuine article. This article differs from M. Mège's oleomargarine, since the latter does not contain more than a trace of butter, and it is sold as genuine butter.

Tallow oil is also used to adulterate cheese. It is well known that whole milk cheese is much better than skim-milk cheese, but butter is much more valuable than cheese, and an enterprising New York company has solved the problem of

how to make whole milk cheese and butter from the same batch of milk. The milk is allowed to stand overnight; the cream is then removed and an equivalent portion of tallow oil added; this is thoroughly mixed by agitation, and then the curd is made in the usual way.

The regular articles of tallow butter that are made and sold as such can hardly be classed among adulterated articles. They are mere imitations, and in their proper place are useful articles. They furnish a very good substitute for butter in almost all culinary operations, and are much better than a great deal of the poor butter that is sold for such purposes. Pure tallow oil is a body that is without any disagreeable taste or smell, and forms an excellent substitute for lard. It can be made at about the same cost, and, if it could be obtained in the market, would no doubt be preferred by many who object to the use of any of the products of the hog, and yet who cannot afford to use butter in place of lard.

THE TALE OF A RAT.

The last number of the London *Telegraphic Journal* contains, under the above heading, the following good story: —

It having become necessary on a recent occasion, in one of our large provincial towns, to withdraw a cable of gutta-percha wires from some iron pipes, in a busy thoroughfare, the inspector in charge commenced operations shortly before midnight, to avoid the crowding which generally attends such feats in the daytime. The flush-boxes being opened the man commenced hauling, the wires travelling with remarkable ease, till suddenly the workmen were interrupted by a shout from the inspector. They had forgotten to attach the iron wire to the other extremity of the cable, which is indispensable to the pulling in of a new or the return of the old cable when necessary. However, it was no use crying over spilt milk; the cable could not be thrust back, so the work was concluded, the boxes closed, and our friend retired to a restless couch with the conviction that he had done a stupid thing. After sundry turnings and twistings, a "happy thought" struck him, and, his mind at rest, he fell into deep repose.

The following day at the same hour, having invoked the aid of a rat catcher, he returned to the scene of his former exploit, armed with a large rat, a ferret, and a ball of string wound on a Morse paper drum. The boxes were opened, and the rat having previously had one end of the string firmly attached to his body, was put into the pipe. Charmed with unexpected liberty, monsieur scampered away at a racing pace, dragging the twine with him until he reached the centre of the length of pipe, when he stopped to investigate matters. The ferret was then put in, but the sight was enough. Off went the rat again until he sprang clean out of the next box. One length was thus safe, and the same operation was commenced with the other; but the rat, objecting to be made a cat's-paw of, stopped short a few yards in the pipe, and boldly awaited the approach of the ferret. A terrific combat then commenced, cries and shrieks reaching the ears of the alarmed spectators outside, who dreaded, not only an utter failure of the second operation, but a stoppage of the pipes by one or more dead bodies. After sundry violent jerks had been given to the string, however, the combatants, alarmed at such unexpected interruptions, separated; the ferret returned to his master, and our friend the rat, making for the other extremity of the pipes, carried the string right through, and so relieved the inspector from his anxiety.

THE BAROMETER AND THE ATMOSPHERE.

[The following paragraphs form a sequel to the record of "Climatic Observations" printed in the March number of the JOURNAL.]

What *causes* the ever-varying weight of the atmosphere before shown, with the constant rise and fall of the barometer? Professor Espy says, "As soon as one storm is over, nature begins to prepare for another, and so in general the longer the preparation, the more abundant the result." This watery vapor may be nearly all deposited from the atmosphere, not leaving one fourth of an inch, and again it may have enough for a rainfall of eight inches, or possibly more, though very seldom. These eight inches of water, whether in the invisible form of vapor or in that of cloud, must add to the general weight of the air about 4.63 ounces, per square inch, raising the barometer proportionately, or .58 of an inch. Here, then, is one ever-varying cause of the rise and fall of the barometer, though not the main one. This would cause a gradual rise from one storm to another, with a more sudden fall. Other causes modify this gradual influence. I know some meteorologists intimate that this vapor, especially in the form of cloud, does not add to the general weight of the atmosphere; but this reminds one of the ancient problem, Why does not a live fish, floating in an urn of water, increase the general weight?

But again, since the air is 840 times lighter than water, a kind of aerial fluid, why must there not be tides in the atmosphere, corresponding to those in the ocean, only 840 times greater, and from the same causes? If so, such tides would modify the rise and fall of the barometer, as each tidal wave should pass over it, twice daily. But the barometer indicates no such regular tides. Other more powerful causes interfere and break up this regularity. The air is too light and ethereal to be thus controlled. The barometer often remains perfectly stationary for several days in succession, and again changes rapidly.

The *heat of the sun*, and not gravitation of the moon, is doubtless the great disturber of our atmosphere, setting the winds in motion. This heat proves more or less intense in different localities, modified not only by clouds above, but also by the general surface of the country below. Thus the progress of the sun goes on multiplying and increasing centres of disturbance, like so many eddies, till one interferes with another, throwing wide regions into commotion, and giving us all that variety of winds and changes in the barometer so peculiar to our climate. Tide and vapor may modify, but the winds caused by heat break up all their regularity, and give wonderful variety and seeming confusion. By careful observation, however, laws may yet be discovered by which the weather may be foretold for days and weeks, if not for the year, not as "probabilities," but with certainty, like an eclipse.

This general disturbance of the atmosphere may be compared to waves in the ocean, only these ethereal waves are chiefly on the under surface, rather than the upper, and so as one wide swell of condensed air passes by after another, the barometer must rise and fall, indicating the exact weight at the time. The gradual rise and fall of the barometer is just what might be expected from such unequal waves, varying from five to ten in number each month, according to the season of the year. The direction of the wind must be at right angles with the wave, rushing to restore the general equilibrium.

But why does the fall of the barometer indicate rain, and its rise fair weather? This is true only in part, and chiefly in the extremes. In all great storms the winds are found blowing on every side toward its centre, where they meet and must consequently ascend, often with a strong current. This upward motion relieves the barometer and it must fall, being lowest in the very centre of the storm. The moist air of the surrounding winds, being thus carried upward into the colder regions above, is condensed into clouds, pouring their contents back in plentiful rain. These storms originate chiefly in the West Indies, take a circuitous course to the continent, and then follow our Atlantic coast, terminating in the colder regions of the British Provinces. Our showers are formed in much the same manner, only on a very limited scale, and soon exhaust themselves. A storm is often five to seven hundred miles in diameter, and is borne along by that elevated current ever blowing from the equator toward the pole to restore the general equilibrium. As the centre of the storm passes by, the barometer begins to rise, and consequently indicates the return of fair weather. As the barometer is lowest in the centre of a storm, the watery vapor there going up to form the cloud and rain, so the barometer is highest on the outer borders of the storm, caused by the superincumbent cloud resting on the surrounding region, the fruit of those currents without, tending toward the centre. Hence a very *high* barometer may indicate the proximity of a storm, *before* its indication by a *fall*, when it must be just at hand, perhaps already begun. This view accords with Professor Espy's theory, and is corroborated by my own brief observations.

One further item. As the weight of the air is about fifteen pounds to the square inch, and the surface of an ordinary man is estimated at about two thousand square inches, such a man sustains fifteen tons' weight from atmospheric pressure. But by a range of two inches in the barometer, a variation of a ton's weight is indicated, enough, it would seem, to produce quite a sensation in a person, especially should it occur suddenly, or even in a single day. But the heavier this pressure, the more buoyant and elastic his feelings, as one finds it far easier to swim in salt water than in fresh. Although these variations are usually very gradual, and hence not so perceptible, yet they are not the less real, in varying the elasticity or depression of many individuals, especially those who are nervous, delicate, and sensitive.

D. W.

Natick, *January*, 1875.

HINTS FOR EXPERIMENTS.

An Amusing Experiment. — The *English Mechanic* says: "Cut (if you dare) four small white feather-points from your wife's best bonnet, and insert them into two small pith-balls, in imitation of wings. Fasten these butterflies to two fibres of raw silk of about a foot in length, and suspend the whole from the ceiling by means of another fibre. Excite the chimney of a moderator lamp with a silk handkerchief, give the glass to one of your young friends, and request him to persuade the butterflies to enter the tube. His ineffectual attempts to capture the butterflies will create much merriment. Breathe momentarily into the tube, or remove the electricity by some other unobserved method, and, of course, the feat is easily accomplished, while the astonishment of the beholders is intensified."

A Match under the Microscope. — A correspondent of the *Scientific American* writes as follows: "Those who are fond of investigations with the microscope will find a beautiful object in the head of a parlor match. Strike the match, and blow it out as soon as the head has fused sufficiently to cause protuberances to form on it; on the part of the head which took fire first, will be found a white, spongy formation, which, under the microscope and with a bright sunlight upon it, has the appearance of diamonds, crystals, snow, frost, ice, silver, and jet, no two matches giving the same combination or arrangement."

Oxidizing Power of Charcoal. — Freshly prepared leucaniline dissolves in alcohol, and forms a perfectly colorless liquid, which may be kept for

a long time without change. If this solution is boiled for a few moments with a small quantity of animal charcoal, it becomes of a deep carmine red, due to the action of the oxygen condensed in the pores of the charcoal.

Oxidation shown by Change of Color on Contact with Air. — If a tolerably concentrated alcoholic solution of naphthalene red is boiled for a few minutes with zinc dust, a colorless solution is obtained; and if the flask is corked while full of the vapor of the alcohol, the liquid remains colorless, and the zinc settles to the bottom. If the flask is then shaken so as to wet the sides, and the cork withdrawn, the inner walls are instantly colored deep red. It is only necessary to boil again, in order to repeat the experiment.

THINGS WORTH NOTING.

The First Land discovered by Columbus. — It may not be generally known that there has been a dispute as to which of the West Indian islands it was that Columbus first discovered and named San Salvador. On all American maps that we have seen, Cat Island is thus designated, but on most English maps Watling's Island is the one. The latter lies a little to the southeast of the former, and is the first land made by the Pacific Mail steamers after leaving New York, from which city it is said to be just a thousand miles distant. Lieutenant Beecher of the English navy proves quite conclusively, we think, that Cat Island cannot be San Salvador, and that Watling's Island answers the conditions required better than any other island lying in the track of the Genoese navigator. Columbus states that he rowed around the northern end in one day. The size of Cat Island makes this physically impossible there, while it is quite feasible at the other island. He also speaks of a large lake in the interior. There is no such water on Cat Island, while such a lake does exist on Watling's Island, as may be seen by reference to Colton's or any other large atlas. Lippincott's "Gazetteer" also states that "a lake occupies its centre." It belongs to Great Britain, and has a native population of several hundred, with a few European residents.

The Tongue of the Fly. — The fly's tongue is curiously constructed, and beautifully adapted to its purpose. Dr. Packard gives the following description of it: —

"When the fly settles upon a lump of sugar or other sweet object, it unbends its tongue, extends it, and the broad, knob-like end divides into two flat, muscular leaves, which thus present a sucker-like surface with which the fly laps up liquid sweets. These two leaves are supported upon a framework of tracheal tubes which act as a set of springs to open and shut the muscular leaves. Thus the inside of this broad, fleshy expansion is rough like a rasp, and, as Newport states, 'is employed by the insect in scraping or tearing delicate surfaces. It is by means of this curious structure that the busy house-fly occasions much mischief to the covers of our books by scraping off the albuminous polish, and leaving tracings of its depredations in the soiled and spotted appearance which it occasions on them. It is by means of these also that it teases us in the heat of summer, when it alights on the hand or face to sip the perspiration as it exudes from the skin.'"

Polishing Powder for Silver Plate. — A correspondent of the *English Mechanic* writes as follows: Take a strong solution of sulphate of iron and precipitate it by means of common washing-soda. Filter off the liquor and dry the powder at a gentle heat. Mix equal parts of this reddish powder and the finest prepared chalk. The more intimately the two are mixed, and the finer they are reduced, the better they will act. Always avoid the use of powders containing mercury or mercurial salts.

Practical Chemistry and the Arts.

SALICYLIC ACID.

Some years ago Professors Kolbe and Lautemann made the discovery that when carbolic acid was subjected to the action of carbonic acid and sodium at a high temperature, and the resulting salt decomposed by hydrochloric acid, a substance was produced which proved to be identical with the salicylic acid obtained from wintergreen oil. Like many other great discoveries, its importance was overlooked for a while, it being merely considered to be another of the now rapidly increasing number of organic substances which can be prepared artificially.

Salicylic acid had previously been prepared by heating wintergreen oil, which is a methyl salicylate, with potash lye, and decomposing the potassic salicylate with hydrochloric acid. It owes its name to the fact that it can be prepared, indirectly however, from salicin, which was discovered by Leroux in 1830, in willow bark. Its formula is $C_7H_6O_3$. It crystallizes in small, colorless, odorless crystals, almost wholly insoluble in cold water, quite soluble in hot water, and more soluble in alcohol and ether than in water. The addition of sodic phosphate to the water increases its solubility to one part in fifty. It melts at 155° to 156° C., and can be sublimed if carefully heated; but if heated rapidly to 220° C., it is decomposed into carbonic and carbolic acids. This reconversion by heat into its original components led Professor Kolbe to make some experiments on its antiseptic powers, with encouraging results. A few of these may prove interesting to the readers of the Journal.

In the first place, to test its action on ferments, he dissolved some amygdaline in water and to the solution added a small quantity of salicylic acid. After thoroughly mixing the two he added an emulsion of sweet almonds. In less than a quarter of an hour another mixture of almond emulsion and amygdaline, which contained no salicylic acid, smelled strongly of bitter almonds, but this odor was not perceived in the other mixture for a few hours if the quantity of acid was very small, and not even in 24 hours if the quantity of acid was considerable.

Mustard, when mixed with lukewarm water, gave off the smell of mustard oil in a few minutes, but the mixture was odorless if the water contained any salicylic acid.

The addition of a thousandth part of acid to a solution of glucose prevented fermentation even when yeast was added, and solutions already fermenting stopped on adding salicylic acid. Samples of excellent Leipsic beer were exposed, lightly covered, to a temperature of 20° to 24° C. for two weeks. One glass, which contained none of the acid, spoiled and became mouldy at the end of the second day; when 0.2 gram of salicylic acid was added to 100 grams of beer, the fungus growth began on the third day; with 0.4 gram acid, on the fifth day; with 0.8 gram, on the tenth day; and with 1.2 gram, no mould appeared in 12 days, although the beer, of course, was sour.

Fresh milk containing 0.04 per cent. of salicylic acid kept 36 hours longer than other milk. Meat was kept fresh for a month by packing in the dry acid, and experiments are now being made with eggs.

Professor Thiersch has used it upon contused and incised wounds, and in operations, with excellent general results, destroying the fetid odor of cancerous surfaces and pyæmic ulcerations.

The process of manufacture employed by Dr. F. von Heyden, Dresden, is to mix together suitable quantities of pure carbolic acid and a solid alkaline hydrate, caustic soda, lime, or baryta, and heat in a retort to 185° C. until all the water and excess of phenol are driven out. Dry and pure carbonic acid is then conducted into the retort, and the temperature increased towards the end of the operation to 200° C. The mass gradually becomes compact, and the action is ended when but little phenol goes off. The preliminary heating to remove the water may be done in a capsule before introducing the materials into the retort. At the close of the operation the mass in the retort is dissolved, and the para-oxybenzoic acid precipitated by hydrochloric or other suitable acid. These crystals are washed and recrystallized from a hot solution, and when dry have a light brown color. No method, so far as the author is aware, has been devised for bleaching that is not quite difficult and expensive, and the acid manufactured in this country at present is sold in the unbleached state. E. J. H.

THE "HEATHEN CHINEE" ON RAILROADS.

The following, according to *Iron*, is a specimen of what the *Houei Pao*, a Shanghae newspaper, has to say about the proposed introduction of railways into China: —

"Remember, O reader, how the Celestial Empire prospered for three thousand years, till the barbarians came in and introduced their horrible customs. Now they allow no one to rest. They keep everything moving. They rush with their accursed engines into every creek and river of the country, spying out and worrying a happy and industrious people. The English are like their own steam, always 'boiling and bubbling.' They upset everybody to make money out of them. They have drained the land of Sycee silver, and now they want steady, law-abiding subjects of the sun and moon to spend their money in railway engines, which blow up and cut people into little pieces more effectually than the public excutioner could do. The idea is monstrous.

"Canals are much better than railroads. The good Confucius invented them, and it was during his life on earth that they were dug. They have been tested by time and experience, whereas railroads are only sixty years old. Life on a canal junk is tolerably secure. A man can sleep by night and fish by day, and hold his soul in peace. A merchant need not buy a coffin before he starts upon a journey. All he wants is time and patience. There is a commercial advantage, too. Goods cannot be accumulated, and thus prices can be kept up. But note what happens when railroads are introduced. In the first place, they are dangerous. They love accidents. The engines are like gunpowder with fire under it. Trains run into each other, and leave only corpses and lumber on the road; or they rush off the tracks, jump down precipices, tumble into rivers, and very often crash through honest men's houses. Sometimes they run away of their own accord, and then they go so fast that wheels fly to pieces and kill everybody near them. The barbarians know all this so well that they keep surgeons to attend to the wounded, or pay beforehand for the coffins, perfumes, colored papers, crackers, and other funeral offerings to the priests of the great Joss. Then they publish big books full of lists of accidents, and of the killed and wounded. Beside all which, merchandise is carried so fast by these railroads that stores are filled rapidly, innocent tradesmen have to pay storage whether they want the goods or not, and things are made too cheap. Then railroads would occupy space. Agriculture and farming would be stopped, and the good people who now carry goods in boats, or on their backs over the mountains, would be deprived of their livelihood. There is no doubt that canals are much better than railroads, and the wisdom of the holy Confucius must be respected."

An International Exhibition of marine and river industries is to be held at Paris next fall.

NICKEL MINES.

Most of the nickel of the world, until within a few years, came from Germany, but the discovery of mines in America has entirely driven the foreign article from our market, and considerable quantities are now exported to Europe. But one deposit is worked in America, and it is believed to be the largest yet discovered in the world. The mine, of which we find an interesting account in the *Druggists' Circular*, is in Lancaster County, Pennsylvania, on the high land separating Chester and Pequea valleys, a region rich in minerals; for, besides the copper found in connection with the nickel, there are large deposits of iron and limestone a short distance south. The existence of copper there was known seventy years ago, but the mining was never prosecuted with much vigor, and afforded little profit.

The copper was impure, but about the year 1856 the material mixed with it was discovered to be nickel, which predominates as the depth of the mine increases. The ore is very hard, and the mining is carried on altogether by blasting. There are a few Cornish miners to take the lead, but the rest are Americans. A Cornish pumping-engine, seventy-five horse power, draws half a barrel of water at every stroke from the mine, which is two hundred and forty feet deep, and another brings the ore to the surface. The ore is iron-gray in appearance, very heavy, and in some pieces the bright copper ore is very prominent. The amount taken from the mine varies from four hundred to five hundred tons per month. The mining and manipulation of this amount require one hundred and seventy-five hands, employed here and at the furnaces. The ore has to be hauled in wagons about half a mile to the furnace, which is situated on very high ground, and overlooks the beautiful Pequea Valley. This situation was chosen partly that the wind might carry away the noxious smoke and gas, and partly because of the stores of limestone and flint in the neighborhood.

The process adopted is first to throw the ore between the jaws of a ponderous iron breaker, by which it is reduced to small fragments weighing about half a pound each. Thence carts convey it to the kilns, which are constructed very much like the old-fashioned lime-kilns, except that these have a very tall smoke-stack, to increase the draught. A kiln holding eighty or ninety tons, is filled with ore and kindled with a little wood. It burns for about six weeks, its own gas supplying the fuel for burning out the impurities. This first step towards purification is followed by a process almost precisely similar to that to which iron is subjected. There are three large furnaces, and into these the ore is put, mixed with powdered flint and limestone (the former predominating) and coke. About three draws are made in twenty-four hours, for the work does not stop night or day, two sets of hands being employed. The product of the furnaces is passed through iron rollers and crushed to powder, in order that it may more easily be transported to Camden, New Jersey, where the final process of separating the nickel and copper, and preparing each for the market, is effected. No waste is allowed. The ore dust, large quantities of which are made in drilling and blasting, is mixed with flux and clay, baked in square bricks, and reduced in the furnaces, like the rest of the ore.

The pure nickel commands a high price, varying, of course, according to the demand, but averaging over two dollars per pound. Not only does this mine supply all the material for the nickel coins, but nickel is being extensively used in plating iron and other metals, and in various compounds. The whole property is owned by a Philadelphia gentleman, who by his energy and capital has opened up a new branch of industry to the American artisan, and has taken another step towards making us independent of other nations.

MEMORANDA IN THE ARTS.

New Method of Toughening Paper. — French journals state that paper may be rendered exceedingly hard and tenacious by subjecting the pulp to the action of chloride of zinc. After it has been treated with the chloride it is submitted to a strong pressure, when it becomes as hard as wood and as tough as leather. The hardness varies according to the strength of the metallic solution. The material thus produced can be easily colored. It may be employed in covering floors with advantage, and may be made to replace leather in the manufacture of coarse shoes, and is a good material for whip-handles, the mountings of saws, for buttons, combs, and other articles of various descriptions. An excellent use of it is in large sheets for roofing. Paper already manufactured acquires the same consistency when plunged, unsized, into a solution of the chloride.

An Improvement in the Heliotype Process. — A modification and simplification of the heliotype process has lately been made which is susceptible of many important applications. By this means, if a drawing, or matter of any sort, executed with an ink which has the tannate of iron for its base, — such as nearly all black writing inks, — be laid upon a sheet of bichromatized gelatine and exposed to the light, owing to the chemical action of the tannin contained in the ink, a perfect copy will be obtained, which can be printed from at once, without the intervention of photography. The new process is very useful in copying letters, circulars, price-lists, etc., where time is an object, as well as in copying the original drawings of an artist. This last is of great importance, as it is almost impossible for the engraver from such a sketch, who engraves the block to be printed from, to thoroughly translate all the fire and the peculiarly effective and powerful touches of the original drawing. By this process, however, a perfectly accurate copy, even to the most minute detail, is obtained.

Fire-Proof Starch. — According to Professor Gintl, in his report on practical chemical preparations at the Vienna Exhibition, ammonia alum (sulphate of alumina and ammonia) and hyposulphate of soda are additions to starch which make it very effectually fire-proof. This is important, as both are cheap substances, easy to obtain, and without any action on most colors. The latter substance prevents, though not so perfectly as some other compounds, a full inflammation, while it is a fact worthy of remark that the quality of the starch which causes it to give stiffness and gloss to the material to which it is applied is not in the least affected.

PRACTICAL RECIPES.

Colorless Varnish. — Dissolve 2½ ounces of shellac in a pint of rectified alcohol; boil for a few minutes with 5 ounces of well-burned and recently-heated animal charcoal. A small portion of the solution should then be filtered, and if not colorless, more charcoal must be added. When all color is removed, press the liquor through a piece of silk, and afterwards filter through fine blotting-paper. This kind of varnish should be used in a room heated up to at least 60° F., perfectly free from dust. It dries in a few minutes, and is not liable afterwards to chill or bloom. It is particularly applicable to drawings and prints that have been sized, and may be used for gilding.

Cement to Unite Brass and Wood. — The *English Mechanic* says that the best cement for this purpose is a glue composed of best gelatine 1 part, glacial acetic acid 1 part. Soak the gelatine in cold water until it has swollen up and become quite soft. Throw away the water and dissolve the gelatine in the acetic acid, applying gentle heat if necessary.

Agriculture.

POTASH UPON NEW ENGLAND SOILS.

The results of the crop experiments which we have conducted for the last dozen years lead to the conclusion that potash is an element of plant nutrition greatly needed on all our New England soils. It may be that the soluble nature of potash has led to the exhaustion which is found to prevail, as our soils are light and not very retentive. In all cases in which we have used potash upon our lands, beneficial results have followed; and we have not been surprised at this, as the results of analysis have shown that the deficiency of potash is too great to allow of large crops being secured unless it is supplied. It is one reason of the failure of the potato crop. If land is exhausted of potash it is impossible to grow healthy tubers upon such land. New lands are capable of growing large crops of sound potatoes, because of the presence in them of ample supplies of potash. Professor Storer's experiments corroborate this view. He says it is plain that the soil needs fertilizers that are rich in potash, and that, under the existing condition of things, no advantage can be gained by applying mere phosphatic or nitrogenous fertilizers to the land. The soil evidently contains a much larger store of phosphatic and nitrogenous substances that are available for the use of plants than it does of potash compounds. Hence very little useful effect has been gained by adding phosphates and nitrogen compounds to the potassic manures. If only potash enough be given to this soil, the latter can of itself supply all the other ingredients that compose the food of plants, at least for the term of years during which the experiments have lasted, and for as many more, of course, as the store of phosphates and nitrogen may hold out. Consequently, until such time as the natural supply of these substances shall begin to fail, it would be wise to apply but little of them. The crying want of the land is for potash, and it is the potassic manures that should be applied to it, to the well-nigh complete exclusion of other fertilizers, until an equilibrium has been reached.

This conclusion is most directly and clearly enforced by Professor Storer's experiments, so far as regards the soil of the experimental field; and from analogy it would naturally be inferred that the same conclusion would apply to other New England soils similarly composed and situated. But in order to establish this general conclusion beyond all chance of doubt, it would be necessary to make many other experiments in different localities, were there not already a mass of confirmatory evidence bearing upon the subject. There are, in fact, already available a number of observations, usages, and traditions that go far to prove that the potassic manures are specially needed in New England. It has long been believed, for example, — for a century probably, and perhaps for a still longer period, — by the farmers near Boston, that night-soil is a "forcing" manure that soon "exhausts the land" to which it is applied. The long horse-manure, on the contrary, from the stables of that city, which is a mixture of dung with much straw that has served for bedding the animals, has always been held in high esteem by the farmers of the locality, in spite of the fact that the dung

almost always undergoes fermentation before it is removed from the cellars of the stables, and must, consequently, have lost much of the nitrogen that was originally contained in it. For this ill-kept horse-manure the farmers are glad to pay the stable-keepers a considerable price in the first instance, and they are afterwards at the expense of transporting the bulky material some miles into the country, and are often put to the further cost of rehandling it at the farm. But for night-soil there is no quick market. By far the larger part of that produced in the city finds its way to the sea. Even in the times when water-closets were unknown, and the present system of discharging the filth of the city into its sewers had no existence, thousands of tons of night-soil were shot overboard from the city wharves and bridges, in order to avoid the expense of hauling it four or five miles to the farm land.

But horse-manure is a potassic manure, while night-soil, whether fresh or stale, is not. The hay and oats eaten by the horses of an American city, and the straw upon which the horses sleep, all contain a much larger proportion of potash than do the bread and meat and vegetables that serve as human food. The more thoroughly, moreover, the original horse-manure has been wasted by fermentation, so much the richer in potash will be the matters that are left. But night-soil when fresh is rich in nitrogen, and when old it is a phosphatic manure charged with more or less nitrogen; the proportion of potash contained in it at any time is, comparatively speaking, small. Hence upon soils that lack potash, night-soil can produce only a temporary useful effect. The active nitrogen contained in it would naturally "force" the soil to give up to the first crops what little available potash it might possess, and the land would thus be "exhausted."

PROFITABLE CROPS.

A large number of letters reach us from farmers who inquire what crops we would recommend to be raised upon certain parcels of land, with the view of getting from them the largest cash returns. These are very difficult questions to answer; in fact, any answer must be to a large extent empirical, and the opinion untrustworthy, as there are conditions to be taken into account of which we can have no knowledge. The nature of the land is to be considered, its fertility, its situation, its nearness to market, etc. Unless land is put in good tilth, no crop can be raised with profit. A hundred times have we said to farmers, cultivate less land, and put every rod of that which is cultivated into high condition. It is an axiom in successful farming, that one acre must be made to give returns equal to four, under the old system of New England farming. Make an acre give you eighty or one hundred bushels of corn, or thirty-five of wheat, the same of rye, or three tons of hay, and then you are on the road to successful farming. You cannot afford to drudge away upon land which gives you but one third of these results.

We have one measured acre of land which for twelve years we have studied carefully, and kept an account of the expenses and value of crops, and it has afforded us much instruction. Last year the acre gave us thirty-five bushels of summer rye, and about two tons of straw. The rye we sold the present spring for $1.25 per bushel, and the straw had a cash value of $25 the ton. The cash value of the crop was therefore $93.75, and if from this we deduct the expenses so far as they can be fairly estimated, about $28, we have a clear profit of more than $65 from the acre of land. Now if a farmer has ten or twenty acres under cultivation, giving like results, they afford him a fair income, and with the returns from other farm departments, the business of farming does not appear pecuniarily bad.

The truth is, farming must be studied, and well considered; it must be conducted as a merchant conducts his business, with intelligence, forethought, and good common-sense. Farmers must look upon their land as a merchant does upon his merchandise, and the question to be pondered is, How can I make it pay me the best profit? Farming, that is, the right kind of farming, is a good business; we insist upon it, it is a good business for a young man to follow.

AGRICULTURE AS A PURSUIT.

There is in our family of readers a large number of physicians, druggists, clergymen, merchants, chemists, etc., and we have never heard a word of complaint from any one of them that we bestowed too much attention upon agriculture, or that they were not interested in the subject. Agriculture is so fascinating, so noble, so grand in all its relations and bearings, that all classes of readers, if they do not own a rod of land, are fond of agricultural literature. There are but very few in any of the professions, or in any of the industrial pursuits, who do not cherish a secret hope or expectation that some day they will own a farm, and till it, and die upon it. As people grow older, they love to think of mother earth; they love to look upon broad acres, covered with the bounteous gifts of a kind Providence; they love to hear the birds sing; they love to look up into the heavens, broad and expansive; they love to bathe in sunlight, and feel the mild breezes of summer laden with sweet odors from woods and flowers. Young men often say they *hate* farming and all that is connected with the pursuit. They would, like John Randolph, go out of their way a mile to kick a sheep; and as to cows, oxen, and all animals but a horse, they never wish to look upon them. If they live to middle life, they "meet with a change," and if their success has been indifferent, in whatever pursuit they may have fallen into, then the wish is heard expressed, that they had remained upon the farm. The tilling of the soil is a glorious calling, and depend upon it, young men, the time is coming when it will be more remunerative than most trades and professions.

THE AYRSHIRE CATTLE.

Massachusetts has good reason to be proud of many of her sons, who are doing a great and useful work in improving breeds of animals, and conducting all the various branches of husbandry in a highly intelligent and scientific manner. The labors and example of these gentlemen are worth much to the country in general, as well as to the State in which they reside. Among these we would place Dr. E. L. Sturtevant and his brother Joseph, of Framingham, first and foremost. They belong to a better class of agricultural investigators and experimenters than some of the men who have for many years managed to keep their names before the public as men "interested in agriculture." We are led to these remarks by reading a work just published by the Sturtevants, "The Dairy Cow: a Monograph on the Ayrshire Breed of Cattle." This is an interesting and important book, and contains a great deal of information relating not only to the Ayrshire breed of cows, but to the Scotch and Jersey stock. The appendix furnishes a treatise upon milk, its formation and peculiarities, which every dairyman should read. The book contains numerous photographs of celebrated animals, and also one of the wild cattle of Scotland. The volume is published in this city by A. Williams & Co., Washington Street.

HINTS AND MEMORANDA.

To Distinguish Wholesome from Unwholesome Meat. — The London *Sanitary Record* says: "The characteristics of sound, wholesome meat are that it is firm and elastic to the touch, and when pressed by the hand it does not retain any indentation. It should have little or no odor. The lean should have a 'marbled' appearance, and should not turn watery or become wet after standing a day or two. Avoid meat which is of a pale pink color, which is an indication of disease, or of a deep purple color, which is a sign that the animal has either died a natural death or suffered from acute fever. A little practice and observation will readily enable you to discriminate wholesome from unwholesome meat. It would be as well not to make your purchases by night; the characteristics of good meat can be best seen by daylight. So well, indeed, was this fact understood by the city authorities of old, that the 'Liber Albus' contains an enactment 'that butchers shall close their shops before candle-light, and shall not sell meat by the light of candle.'"

Cabbage and Ham Salad. — The following recipe is from the *Country Gentleman:* Take two small heads of cabbage, well washed, and chop them quite fine; slice off a dozen or more thin slices of tender boiled ham. Mix the two together in a salad bowl. Make a dressing of two raw eggs, mixing the yolks with half a teaspoonful of mustard, stirred up in boiling water; then add three tablespoonfuls of sour cream just skimmed from the pan, or one small teacupful of salad oil, poured in very slowly, as directed for mayonnaise. Stir for ten minutes, adding a little salt and pepper. Beat the whites of the eggs to a froth, and add to it also four tablespoonfuls of vinegar. This makes a delicious side dish, or a course at the dinner-table, and the housewife will find it a toothsome substitute for a hot dinner when the mercury mounts high up among the nineties, and there is ironing or washing to attend to. Chopped cold boiled potatoes can also be added, and the dish can be prepared out of cold boiled corned beef chopped fine, or from cold roast veal, beef, or mutton. Lettuce can be substituted for cabbage if preferred, and the mustard can be left out.

How to Test the Quality of a Pear. — In the *Revue de l'Horticulture Belge*, M. Buchetet gives a test for ascertaining the quality of a pear. If, says he, you can write on it easily with pen and ink, it is a good pear. Other pears, whose rind does not take the ink so well, are inferior in flavor. It would be curious if this rule did not, like most rules, have its exceptions. So good an authority would hardly have given it without having tested its application to the varieties of the fruit that are most common in Belgium. No doubt some of our readers will be interested to see how it works on this side of the Atlantic.

Boston Journal of Chemistry.

Jas. R. Nichols, M. D., *Editor.*
Wm. J. Rolfe, A. M., *Associate Editor.*

BOSTON, MAY 1, 1875.

SCIENCE AND HEALTH.

The vast benefits which science has conferred upon mankind are not seen alone in improved machinery or better knowledge of the physical universe. Science has contributed in an immense degree to increase human happiness, promote health, and prolong life. The great discoveries which have been made in the various branches of science during the past century have almost all had a near or remote bearing upon man's physical well-being. Not only his moral nature has been elevated and improved, but the "house he lives in" has been purified, braced, and strengthened, so that it requires a more violent tempest to blow it over than formerly.

Think, for a moment, how much sanitary science, which is but the outgrowth of chemical, anatomical, and physiological knowledge, has done for children in the last half-century. There are not, for some reason, so many births, in proportion to the population, as formerly, but a larger number are brought safely through the perils of infancy, up to manhood and womanhood. The bodies of children, instead of being allowed to remain for months and even years without the application of water, are now subjected to frequent ablutions; and the important functions of the skin, which a century ago were almost entirely unknown, are now fully understood. The food of children, that is, kinds and qualities suited to their condition, is constantly improving, and the importance of regularity in meals is quite generally recognized. The importance also of pure air, exercise, and sunlight, but few overlook whose means enable them to live in accordance with well understood sanitary rules.

The consequence of this better knowledge and better practice is the training up of a more vigorous race, and the prolongation of life. Inherited diseases are being rooted out of families to a considerable extent — diseases which have resulted from gross violations of nature's laws, through ignorance and poverty. It is not too much to expect that through the popular diffusion of sanitary knowledge, the race may in the progress of centuries become so far physically improved, that good health will be the rule and sickness the exception among the masses. The physical improvement of the human family in civilized countries is necessarily a slow process, but we are certainly moving in that direction. The ancient Romans, at least the wealthy classes, had a high civilization, but the sciences were not known, and consequently could have no influence upon the physical well-being of the people; consequently human life was burdensome and brief. The average duration of life among the most favored classes in the first five centuries of the Christian era was less than thirty years. In the present century the average longevity of the same classes is fifty years. In the sixteenth century twenty-six per cent. of the children died in their first year; in the nineteenth century but fifteen per cent. die. In the sixteenth century sixty-one per cent. perished before reaching maturity at twenty; but in the present century only thirty-three per cent. As large a proportion now live to seventy as lived to forty-three, three hundred years ago.

It is a common remark, among observing people, that octogenarians, and those close upon that period of life, do not look as old, infirm, or venerable as those of that age forty or fifty years ago. Well, they are not as old; that is, age is not so manifest, so burdensome as formerly, and it is probable that it will grow less so in the centuries to come. Physical life, animal existence, is but a prolonged chemical experiment. If we impede, impair, or disarrange the vital chemical changes which constitute the phenomena of life, why, then we must expect trouble and failure. If, on the other hand, we maintain the apparatus in good order, do all we can to aid nature in perfecting her normal changes and transformations, provide good chemicals in the form of food, maintain proper temperatures, keep all the vital alembics, tubes, and retorts cleanly, so that all reactions may be undisturbed, the life experiment will be harmonious, brilliant, prolonged; and when it ceases, it will be from completion of the reactions, rather than from violent and fatal disturbances.

EDUCATION ABROAD.

Thirty or forty years ago it became fashionable to send young men to England, France, and Germany to be educated, and at that time it was probably true that better facilities were afforded in those countries for supplying scientific and other kinds of knowledge than our own country could furnish. But this is no longer the case. There is now no need whatever of students leaving our shores to be educated, unless it may be in some specialty, and the advantages of specialties abroad are now of little account. The truth is, there is not only no advantage in a foreign training, but many positive disadvantages. Our colleges and schools are to-day, in every form of appliance and possible aid in teaching, in advance of those of Europe. Our methods are better, far better, our apparatus for illustration superior; our museums of natural history, anatomy, etc., as good, our instructors as learned and accomplished, as any in the world.

We have made immense progress in educational matters within the last quarter of a century, a truth which is not only known here but fully recognized abroad. In conversation recently with a distinguished professor at Harvard, we stated as our belief that the time was not far distant, when the tide of emigration among young men seeking superior educational facilities would change, and the column would move westward to our shores, rather than east to the Old World. His reply was, "This has already commenced, and a considerable number of students come here from Europe every year, to be educated in our schools, believing them to be superior to those at home. This is to increase largely every year, and in twenty years the number that come here will be far greater than those leaving us for the other side of the water."

Our "Clubbing List" is the fullest and best offered by any journal in the country, including something choice for all ages and tastes, from the *Nursery* up to the *North American Review.*

VALUE OF THE METALS.

The following is an approximative estimate of the present cash value of the metals now known, rare and common. The rare metals have no market value, but they can be purchased at about the prices below. The price is given per pound, or 16 oz. avoirdupois.

Indium	$2520.00	Silver	18.85
Vanadium	2500.00	Cobalt	7.75
Ruthenium	1400.00	Cadmium	6.00
Rhodium	700.00	Bismuth	3.63
Palladium	653.00	Sodium	3.20
Uranium	576.58	Nickel	2.50
Osmium	325.28	Mercury	1.35
Iridium	317.44	Antimony	.36
Gold	301.45	Tin	.33
Platinum	115.20	Copper	.25
Thallium	108.77	Arsenic	.15
Chromium	58.00	Zinc	.11
Magnesium	46.50	Lead	.07
Potassium	23.00	Iron	.02

MR. R. A. PROCTOR ON YANKEE SCIENTISTS.

In a long article on "The English and American Transit Campaigns," Mr. R. A. Proctor (who, by the way, we are happy to learn is coming here soon on a second lecturing tour) pays the following tribute to Yankee methods in science and the arts: —

We English, unless stirred by emulation, are slow to move; and though we do things in a thorough way, we seldom select the most effective methods for achieving our ends. Our American cousin is less ponderous in his movements, and though to the orthodox British mind his methods may sometimes seem "rough and ready," yet he generally manages to accomplish his object, which after all is the important point. Not unfrequently the ingenuity and fertility of resource of Americans enables them to go easily ahead of us; not indeed that Englishmen are wanting in these qualities, but that either we are slow to exercise them or else find their exercise not appreciated. I was repeatedly struck by this during my stay in America, not only or even chiefly in scientific matters, but in contrivances relating to the conveniences and luxuries of life. To take a few out of many examples: With an enormous country relatively thinly peopled, their system of railway travelling is altogether superior to ours: railways on our system would not pay their expenses in America, and yet notwithstanding a far higher cost per mile, our railway travelling would be simply unendurable there. With winter weather so bitter, in the greater part of the States, that by comparison the cold we thought so much of last December seems trifling, they have warm rooms and warm houses at a tenth part of the expenditure of fuel by which we manage to roast half the body while the other is chilled by cold draughts. They have only recently (by comparison) established meteorological observatories, yet already they have morning and afternoon weather announcements, nine times out of ten correct, for the whole area of the States east of the Mississippi; while we are laboriously, and at great expense, publishing each day announcements of the weather of the day before, as if that could be of any real use. In scientific matters they have a quiet way of taking up and settling problems which we in Europe have most ingeniously and elaborately failed to solve. . . . We got the start of them, indeed, in the matter of the solar prominences, though only by departing from old usage and giving our younger men a chance. But they showed us how to settle the question of the corona, which we had been pottering over ineffectually; and it must never be forgotten that our eclipse successes in 1870 and 1871 were due to their example. Professor Young in America has gone far ahead of us in the analysis of solar sur-

roundings. Professor Langley's investigation of the details of the sun's surface is far better than any yet made by European astronomers. They first photographed the moon, though some of our writers conveniently forget the Drapers, as well as later successes of Rutherford. Every European attempt to measure the duration of the lightning flash, or of the electric spark, failed; but Professor Rood (of Columbia College, New York) has not only measured the duration of the electric spark, but has actually succeeded in determining the relative duration of different portions of the flash. And this is only one instance out of several, in which Professor Rood has accomplished a feat of this sort, I mean the mastery of an experimental problem of exceeding delicacy. Professor Mayer (of the Stevens Institute, Hoboken) has successfully dealt with acoustical problems which had been practically abandoned as too difficult, by European experimenters. These are only typical instances, selected almost at random.

ON THE MEASUREMENT OF AIR-ANGLE OF MICROSCOPE-OBJECTIVES.

BY R. B. TOLLES.

(Concluded.)

After these explanations, a glance at the diagram is sufficient to show that most fallacious indications can be gained by the use of the slit. All that is necessary to that end is to use it as *he* used it for air-angle.

Yet he says, in opening his attack, "I appear again thus early, not in a captious spirit of contradiction, but to notice some fallacies in the methods hitherto used for measuring the aperture of both dry and immersion lenses. The conditions carefully arranged would have been worth bringing before the Royal Microscopical Society, had this not been developed by controversy, both strong and irregular, in which no society could properly be involved, and consequently the question must be settled in the same way."[1]

What was so *important if true* had best have parallel correction, being error. The misuse of his invention he *cannot* deny. *He* demonstrates in the figure quoted (Fig. 2 here) a case of 170° of air-angle. By the same *law of refraction* the central pencils, within say 15° of air-angle, *must* have focus at the much more distant point from *a b* than *c*, as drawn in the figure, where *a F b* make the fatal triangle he adduces — a median elevation of about 85 and a diameter line of 210.[2] Either the "law of refraction" is wrong, or his "plain measurement" of the triangle is a delusion. See Fig. 1.

From his demonstration according to plainest optical law he shows an angle of 170°, while "from the fact of plain measurement" of the triangle that necessarily exists in the case from the same law of refraction an angle of over 100° "is in this case impossible."

How to use the slit and *not* show the angle is now plain enough. How to use it to *tell the truth* is of very simple statement: namely, trust the slit for angle *only* when the objective is *corrected* for an object within the slit. If the objective is "closed," interpose thickest covering-glass; then, all the rays in the body of the front lens having *direction* to *g*, Fig. 2, will proceed straight to a common focus *near* to *g*, *close* to the bottom of the covering-glass, but in air;[3] yet by the law of refraction the *pencil* of 80° marked 40° on one side of the axis in the body of the front and in the covering-glass, will have emergence at the second surface of the covering-glass, and cross immediately contiguous thereto, as seen in Fig. 3, and have expansion in *air*, as before, to 170°. The

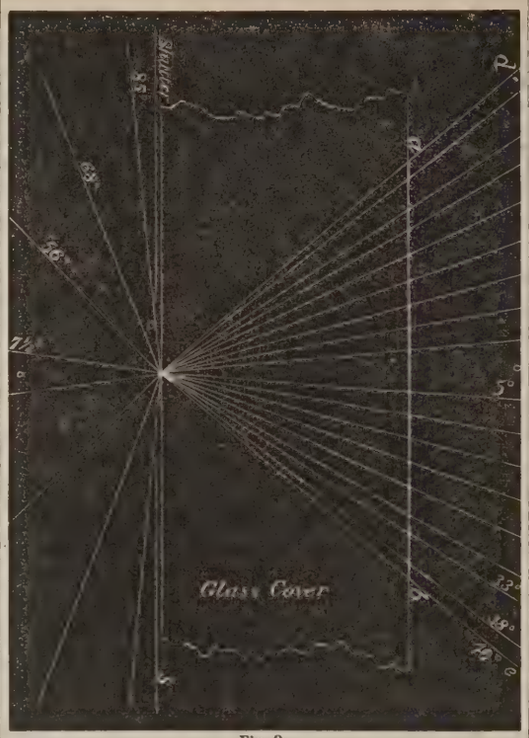

Fig. 3.

central pencil of 10° in the body of the front lens marked 5° one side of axis of the front, expansion, at *g*, to 15° in air. The pencil of 66° in body of the front marked 33° for semi-aperture, will have expansion to 112° in air. The other rays are not shown in *air*.

Andrew Ross invented cover-adjustment, giving "positive" aberration to the objective to correct or compensate for "negative" aberration, which he observed to be produced by covering-glass.

All the world uses the adjustment for cover, and it becomes amusing, to say the least, to see a countryman of Ross, and a recognized teacher of practical optics, insist on ignoring the influence of *cover* upon *available aperture*.[4]

Yet Mr. Wenham by so applying his device of the slit reduces an objective of practically full angle, or "up to 180°," to 112°, and considers it a creditable achievement.

EDITORIAL NOTES.

Scientific Toys. — Why is it that scientific toys, which are so common in England, are comparatively unknown in this country? In a Liverpool or London toy-shop, a boy can get a pretty full set of philosophical and chemical apparatus for a dollar or two. A "shilling box" contains "chemicals, apparatus, and directions for fifty experiments," and there are larger boxes for half a crown (62 cents), and "chemical cabinets" and "boys' laboratories" at all prices from 5 shillings ($1.25) up to 15 shillings. A shilling will also buy a box containing horse-shoe and bar magnets, with materials for a variety of magnetical experiments. Electrical, optical, and mechanical apparatus are put up in hundreds of forms for juvenile use, and at similar prices. A few years ago, "dollar steam-engines" had quite a run in this country, but they were poor things compared with English machines sold at the same price, and even less. There one finds locomotive and marine engines also, and with the latter a set of paddle-wheels may be bought for fitting up a minature steamboat. Ready-made steamboats cost from 16 pence (32 cents) up to as many pounds.

Almost the only thing of the kind made in this country that is of good quality, and at the same time cheap, is telegraphic apparatus. We have seen a "Tom Thumb Telegraph" made in New York, which is sold for $3.50, and which includes sending and receiving instruments, battery and chemicals, wires, and materials for sundry magneto-electric experiments. This, however, is not a mere toy, though it is a capital one for boys, but is actually used for telegraphic purposes, as for sending signals from one part of a large building to another. With a more powerful battery it could be used for much longer wires.

Last Christmas we saw a toy called "Chiromagica," which was an exceedingly ingenious application of the magnet. Another was a cylindrical mirror, in which distorted figures were transformed into their proper shape, by a familiar optical principle. We wish that these were not exceptional instances of scientific playthings. We ought to have hundreds of them, and we believe that they would "pay" as well as the common run of toys.

A Hint for Spelling Matches. — If the orthographical mania continues much longer, all the material in Worcester's and Webster's quartos is likely to be exhausted, and prize spellers will be looking anxiously about for new worlds of words to conquer. We would suggest that they will find an inviting field in the ever-growing chemical nomenclature of the day. As a sample take the following paragraph from the *American Chemist* for March, though it must not be supposed that all the reading in that excellent monthly is of this type: —

"When diphenylmonochlorethan is boiled with alcoholic potassa, a hydrocarbon isomeric with stilbene is produced. This is diphenylethylene. . . By oxidation this substance is converted into benzophenone. Ditolylethylene was obtained by a method similar to that employed in the production of diphenylethylene. Diethylstilbene was produced by the dry distillation of diethylphenylmonochlorethan. It yields terephtalic acid when oxidized. Monochloraldehyde and xylol yield a product which, when subjected to dry distillation, gives rise to the formation of tetramethylstilbene, isomeric with diethylstilbene, together with another compound probably of the same composition. By oxidation tetramethylstilbene yields xylylic acid. Monochloraldehyde and chlorbenzol yield dichlordiphenylethylene."

Excellent and Cheap Copying Ink. — Dr. H. Stieren sends the following recipe for publication in the Journal: —

Dissolve in a porcelain or glazed earthen vessel one and a half drachms of alum, three drachms of blue vitriol, six drachms of extract of logwood, one drachm of gum arabic, and one half drachm of white sugar, in twelve ounces of boiling distilled or rain water; filter, when dissolved, while hot, and keep in a closed bottle. Although the writing will look somewhat light at first, it will soon turn into a purple-black. The best pen for this ink is a gold pen, which can be used for six years or more.

ATOMS.

A brilliant and adhesive paste, adapted to the uses of manufacturers of fancy articles, painters, etc., may be made by dissolving caseine, precipitated from milk by acetic acid and washed with pure water, in

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1 *Monthly Microscopical Journal*, March, 1874, p. 112.

2 The face of the lens makes the "base" and the axial line, or ray, the "median height" to *F*, — but there is no *optical* triangle of the sort possible.

3 In this test for angle the glass slide below the object is not used, but *if* used it would, *as all agree*, make no difference.

4 Mr. Wenham says, "I stipulate the edges of the stop shall be in the crossing point" (there were a *thousand* crossing points). "If any one thinks proper to introduce an intervening plate of glass, *serving no purpose*" (italics mine), "he must focus through it, so as still to get the stop in the focal plane." (*Monthly Microscopical Journal*, November, 1874, p. 223.)

To show the influence of Mr. Wenham's opinion in this matter, witness this: —

"Mr. Wenham is unquestionably right in stating that if an isosceles triangle be described, the base of which is ten times the measured diameter of the front lens and the altitude ten times the measured distance of the focal point from the same surface, the vertical angle of that triangle will correctly represent the *maximum available* aperture." (From the Annual Address of President Charles Brooke before the Royal Microscopical Society, London, February, 1875.)

a saturated solution of borax. — Apropos of paste, an English writer says: "Mix good clean flour with cold water into a paste well blended together, then add boiling water, stirring well until it is of such a consistency that it can be easily and smoothly spread with a brush; add to this a spoonful or two of brown sugar, a little corrosive sublimate, and about half a dozen drops of oil of lavender, and you will have a paste fit to fasten the teeth in a saw." — According to Wanklyn, raw coffee contains 6 to 8 per cent. of sugar, which after roasting is reduced to 1 per cent., or even zero; the fat, on the other hand, seems to be increased by roasting from 4 or 5 per cent. to double that quantity, although perhaps the fat is not actually increased, but merely laid open by heat to the action of solvents. — The simplest way of making vegetable parchment is by passing sheets of unsized paper through a solution of alum and thoroughly drying them; they are then dipped in ordinary commercial sulphuric acid, washed, and dried. — M. Decroix, a chief veterinary surgeon in the French army, gives the equine population of Europe as follows: Russia, 1,800,000; Austria, 3,100,000; England, 2,666,200; Germany, 2,500,000; Turkey, 1,100,000; Spain, 650,000; Holland, 300,000: Belgium, 260,000; Switzerland, 110,000; and France, 3,633,600. — Popular editions of standard literature are not so cheap in this country as in England, where the complete works of Shakespeare or Pope may be had for a shilling (24 cents), Goldsmith for ninepence, Thomson for sixpence, Bunyan's Pilgrim's Progress for twopence, a selection from the best plays at one penny each, and so on through a long list. — A man with a "Philadelphia" diploma who has been practising at Airdrie, Scotland, under the name of "Chadwick de Banzie, M. D., LL. D.," has been convicted as "an unqualified practitioner," and sentenced to pay a fine of £20 or go to prison for three months. — Herr Forster, in a German pharmaceutical journal, states that after a year's experience he finds the best wick for a spirit lamp to be a small roll of gray filtering paper. — The proposed new British Adulteration Act, which imposes no penalty unless the dealer "knowingly" sells a sophisticated article, has been aptly designated by Dr. Playfair as "an act for prohibiting tradesmen from acquiring a knowledge of their business." — The opium crop in India is threatened with blight from the attacks of a fungus belonging to the same genus as the *Peronospora infestans*, and bearing the same relation to the poppy which the famous parasite does to the potato. — A foreign chemical journal says that 10 quarts of water, 10 lbs. of chloride of lime, and 1 lb. of nitrate of copper, heated in a glass flask in a water bath, will furnish 14 cubic feet of oxygen gas. — According to statistics issued by the telegraphic department of the German Imperial Government, there are 27,198 telegraph stations in the world: 18,275 in Europe, 7413 in America, 1129 in Asia, 254 in Australia, and 127 in Africa. — The Great Eastern Railway Company is building a new passenger station in London, which will measure 2000 feet in extreme length, and cover ten acres of ground. — If an electrical discharge be passed through a very fine wire of platinum or other metal placed between slides of microscopic glass, the metal is vaporized, and then instantly condensed on the cold surface of the glass, where it can be examined with the microscope, and used to illustrate the character of the metal, and the peculiarities of the discharge. — The new Inman steamer, City of Berlin, is the largest in the world, next to the Great Eastern, measuring 488 feet in length (512 over all), 44 in breadth, and 34 in depth, with a gross tonnage of 5490 tons; and she has accommodations for 1702 passengers, besides a crew of 150 persons. — No magazine in the world can boast a more honorable record than *Harper's Monthly*, which completed its first quarter of a century and its fiftieth volume with the May number. — Mr. Curtis Guild's "Abroad Again," now appearing serially in the *Commercial Bulletin*, abounds in hints of practical value to "intending" tourists.

QUESTIONS AND ANSWERS.

M. S., Vincennes, Ind. Glass insulators, used in connection with lightning-rods upon dwellings, do not add to the protection afforded, and may be dispensed with. Use a large rod upon your buildings, and attach with iron fastenings. It is very important that the ground connections should be perfect. Use copper, and let them terminate in a well or cistern, or, if this is impossible, carry the terminals down to a point of permanent moisture, at least 8 or 10 feet.

H. A. W., Lowell, Mass. A warm bath should be taken at night just before retiring, and if the system is weak the bed and sleeping room should be warm to prevent taking cold. Very few persons can take a warm bath in the day-time, and go out into the air and attend to ordinary business, without much peril.

J. S. B., M. D., Pekin, Ill. The wall-paper contains arsenic, in the form of arseniuret of copper, and the pigment is easily dislodged in the form of a fine dust. Doubtless it is the cause of the illness in your family.

H. W., Boston, Mass. The water as drawn from the aqueduct pipes which is opalescent at first, and clears up readily, probably contains air. This is often the case, especially after the water has been cut off for a few hours to make repairs. In the spring of the year water is apt to contain fine silt, brought into the lake from roads and ploughed fields, which gives it a turbid appearance.

I. A. G., Methuen, Mass. There is always carbonic acid present in air, and the amount does not vary much at any season of the year. There is enough to destroy the whole race, if it were to obey the laws of gravity, and descend and form a layer over the earth. This layer would be about ten feet deep. The reason why it does not increase in winter, when in our section there is no vegetation to absorb it, is that air moves rapidly from one section to another, and at no time is there a period when some portion of the earth is not covered with luxuriant foliage. Cold water absorbs and retains carbonic acid better than warm, and hence much is taken up in winter by the waters of the ocean and open rivers and lakes.

W. W., Thomaston, Ct. Coarsely ground clam and oyster shells, mixed with gravel, form excellent walks and driveways. Coal ashes are much used, and do exceedingly well in the vicinity of this city. Concrete walks, if properly prepared, are durable and cleanly, and not very expensive.

R. C. A., Markham Station, Va. The little volume, "Chemistry of the Farm and the Sea," by the editor of this journal, for which you inquire, is out of print, and cannot be procured of booksellers. A new edition may be issued by the publishers, A. Williams & Co., of this city, but of this we are not certain.

E. H., Chester, Pa. The meteorological phenomenon, often seen on summer afternoons near the western horizon, to which you allude, is caused by the peculiar position of the sun and clouds. The rays of light are reflected on the surface of the clouds so as to give the appearance of long pencils of light radiating in straight lines from the sun. It is widely known as the "sun drawing water," but this is a vulgar conceit originating away back in the dark ages.

C. A. M., Alton, Ill. A cheap and effective water filter for a small family can be made from a ten gallon keg or wine cask. Put in a perforated diaphragm three inches from the bottom; upon this place a little clean straw, and then a layer of coarsely pounded charcoal, four inches thick. Fill the remainder of the space with clean sand, and you have a cheap and excellent filter, which will last a long time. Of course a wooden faucet should be placed in the keg below the diaphragm, to draw off the clear water.

A. G. L., Milwaukee, Wis. Mineral waters should not be stored or transported in tanks made of "galvanized iron." The water will become poisonous, and should not be used by invalids or by any one.

LITERARY NOTES.

The latest issues in the "International Scientific Series" are *Descent and Darwinism*, by Professor Oscar Schmidt, of Strasburg, and *Fungi*, by M. C. Cooke, edited by Rev. M. J. Berkeley. The aim of the former, as stated by the author, is "to render the reader able to survey the whole ramified and complicated problem of the doctrine of descent, and its foundation by Darwin, and to enable him to understand its cardinal points." It is a straightforward and forcible presentation of the theory, including its application to the origin of man. As a concise exposition of "Darwinism" from one of its ablest advocates, it supplies a long-felt want in popular scientific literature. The *Fungi* is a book of less general interest, but will be welcome to all persons of botanical tastes. Some of the chapters — those, for instance, that treat of the phosphorescence of fungi, their influences and effects on other plants and on animals, their cultivation, and their uses — will interest every reader.

The success of this "International Series" has led the Appletons to inaugurate the "Popular Science Library," a series of dollar volumes of a more elementary and popular character. The first issue, and the poorest of the four already published, is *Health*, by Dr. E. Smith, intended as "a handbook for households and schools." It is in some respects behind the times, and portions of it are better suited to English than to American modes of living; but it contains much that is sensible and practical on food, clothing, exercise, cleanliness, ventilation, and other physiological and sanitary topics. *The Science of Music*, by Sedley Taylor, is a succinct account of that part of the theory of sound which forms the physical basis of the art of music. It includes a better outline of the chief acoustical discoveries of Helmholtz than can be found, as far so we are aware, anywhere else in English. *The Natural History of Man*, by Quatrefages, is the translation of a course of elementary lectures which seem to us models of what such lectures should be. As the eminent French anthropologist holds to the old-fashioned views of the origin of species and the unity of the human race, the editor of the series (Dr. Youmans, we presume) has thought it necessary to give in an appendix an outline of the arguments on the other side, prepared by Prof. T. Gill, of the Smithsonian Institution. The wood-cuts illustrating the races of men, etc., are excellent. The fourth volume of the series is an *Outline of the Evolution-Philosophy*, translated from the French of Cazelles, with an Appendix by Dr. Youmans, giving, *not* the "other side," but his lecture on Herbert Spencer. The book is all that could be desired as a brief popular exposition of the doctrine of evolution.

The Appletons have also published a translation of *Nature and Life*, by F. Papillon, a series of essays setting forth, in elementary form and simple language, "the most essential truths established of late by physiology, chemistry, and biology, regarding the mechanism of natural forces, and the arrangement and combination of the fundamental springs of being in the world, especially in the living world." Several of the essays which have already appeared in the "Popular Science Monthly" have been much admired, and it was a good idea to give the complete series to American readers in a single compact volume. French works of popular science as a rule are either decidedly good or decidedly bad, and this book is one of the best examples of the former kind.

Another "Science Primer" (Appletons) is out — *Astronomy*, by Lockyer. It is hardly up to the mark of its predecessors.

Messrs. Roberts Brothers have just published *Harry Blount*, by P. G. Hamerton, which has been called the best boys' book since "Tom Brown's School Days," and we think it deserves the eulogy. We suspect that the author, like Mr. Hughes, has put a good deal of his own schoolboy experience into the book, and that this is one secret of his success. It is one of the few boys' books printed nowadays that one can with a good conscience put into a boy's hands.

How to Write Clearly, by Edwin A. Abbott (author of the "Shakespearian Grammar"), has been reprinted by Roberts Brothers. We had already seen it in the English edition, and hoped that some of our publishers would have the good sense to issue it here. It is a little book, but for practical purposes, either in school or for self-teaching, it is better than many a bigger one.

The *Paragraph History of the United States*, by Edward Abbott (Roberts Bros.), is another book whose merit is inversely proportionate to its size. It contains less than a hundred small pages, and is sold for half a dollar, but it gives our national history in a nutshell, and in addition brief marginal notes in contemporaneous history. This latter feature is one that might well be copied in manuals of history for school use.

Messrs. Hurd and Houghton have now ready the new revised edition of the *Satchel Guide to Europe* for the present year. The *Pall Mall Gazette*, which rarely praises an American book, pays the following tribute to a former edition: "The book is indeed a model of perspicacity and brevity; all the advice it gives will be found of immediate service. The 'Satchel Guide' tells the reader how to travel cheaply without a sacrifice of comfort, and this feature of the book will recommend it to many tourists." But the proof of a guide-book is in the using, and this bears the test admirably. A Boston manufacturer, who has been abroad for a year with his family, writes from Dresden: "I cannot say too much in favor of the 'Satchel Guide.' It is worthy of all the high encomiums it has so justly received from the tourist, and we invariably sought its pages in preference to others." The work of revision for this new edition appears to have been thoroughly done, and the maps have been materially improved.

The third (April) number of the *Official Postal Guide*, from the same publishers, gives the latest information concerning the department, the new "swindle" on third-class matter, etc. It is invaluable for all who have much to do with the post-office.

Talks on Art, by W. M. Hunt, the painter (Riverside Press), is full of shrewd and piquant hints on art matters, besides being unique in its typography and make-up.

Outlines of Astronomy, by A. Searle, of the Harvard College Observatory (Ginn Bros.) seems better suited for general reading than for school use. It is an interesting *résumé* of the leading facts of the science, accurate and up with the times, as might be expected from the position occupied by the author.

The same house has published Allen and Greenough's *Selections from Ovid*, and their *Method of Instruction in Latin*, a little book which teachers will find helpful and suggestive, no matter what series of Latin text-books they may be using.

Two books of fiction noteworthy for their freshness and originality among the commonplace trash of the day are J. E. Smith's *Oakridge* and Mrs. C. F. Woolson's *Castle Nowhere: Lake Country Sketches*, published by J. R. Osgood & Co.

We have received the *Bulletin de la Société Industrielle de Rouen*, for the year 1874, containing several valuable papers on scientific and industrial topics.

Medicine and Pharmacy.

THERAPEUTICAL ENIGMAS.

A curious and interesting paper on "Insulation of Beds" was read some months ago, before the Central Ohio Medical Society, by Dr. P. M. Wagenhals, of Columbus, Ohio, and subsequently printed in the *Philadelphia Medical and Surgical Reporter*. The author describes a number of cases of rheumatism, including one in his own person, in which simple insulation of the beds, by placing the legs of the bedstead in four glass tumblers, appeared to be of remarkable efficacy in easing pain, inducing sleep, and promoting recovery. He has no theory to offer as to the *modus operandi* of this treatment, but simply records the facts. In some parts of South America, along the banks of the Amazon River, families place the legs of their beds habitually in tumblers filled with water, not, as might be expected, to protect them from insects and vermin, but for the relief of rheumatism and kindred disorders, and to prevent attacks of malarial fevers.

The *London Medical Record*, commenting on this paper by Dr. Wagenhals, says that a French army surgeon, who found the same habit existing in Algeria, has written an elaborate memoir to prove that the benefit of the procedure is owing to the prevention of the escape of the vital electricity from the system.

Several years ago, a leading physician in Philadelphia, eminent also as a medical instructor and author, prescribed this insulation of the bed for a lady of our acquaintance who suffered severely from neuralgia; and we have heard of other instances in which the device has been indorsed by the profession.

We have not space for the details of the cases recorded by Dr. Wagenhals, but we give the following extracts from his summing-up and his comments upon them: —

In two of the foregoing cases the rheumatism was chronic; there was distortion of joints and inability to walk. In all of them, various means for restoration to health had been adopted unsuccessfully, — potass. iodide, sulphur, frictions, and, in some, the galvanic currents, without mitigation, — so that these patients had come to rely chiefly upon opium as the only means of procuring rest and comfort.

The remaining cases were acute rheumatism. In two of them the heart became involved in the course of treatment, which was strongly alkaline, and which is contrary to Fuller's statement that under alkaline treatment the heart is safe from complications. In all these cases the relief was prompt and permanent, and without the use of anodynes. The sensation of warmth and comfort which I felt myself has been felt and mentioned by my patients invariably, and in addition the testimony of persons sleeping with the sick, who were in ordinary health, to the sensation of heat, and the occurrence of profuse perspiration on the second night, tends to show an influence from the insulation of the bed which was unexpected, and yet gives force to the statements of the patients.

One of the patients makes mention of the sensation of drowsiness which came over him by the prolonged use of the insulated bed. This I have noticed in several cases, and distinctly observed it in my own. Now the question is, Do the effects of this form of treatment, which, in comparison with our former modes, is simply marvellous, depend upon expectant attention? Is it another specimen of the wonderful power the mind has over the body, or does it depend upon changing the electric state of the body? It certainly deserves attention, as, in either case, the patient is benefited, and this is the end of all therapeutics.

Just as we were about to put the above into the hands of the printer, we received from an aged physician, who has now retired from the active duties of the profession after a successful and honorable practice of half a century, a communication which he prepared many years ago for publication in a medical journal, but subsequently decided to withhold from the press. He recently found it among some old papers, and gives us leave to print it. It is entitled "About Erysipelas," and reads as follows: —

In submitting the following facts to the profession, the writer is fully aware that he exposes himself to the charge of ignorance and superstitious credulity. That he will disregard, if by making them public he can succeed in fixing attention to an old, or in eliciting a new truth.

Mrs. W——, an old lady of sixty years, had for many years been subject to attacks of erysipelas in her face and head, generally in early spring or late in the fall of the year. The attack usually came on with a red, burning spot in one of her cheeks; and from that the inflammation rapidly extended over the nose to the other cheek, soon involving the whole face and also the whole head, and, being attended by great feverish excitement, often endangered her life.

It is unnecessary here to dwell upon the remedial measures employed by her physician (who was eminent in his profession, and afterwards my preceptor), only so far as to say that the treatment was commenced by bleeding freely at the arm, and to add that its effect clearly proved the propriety of its employment. At the times when she generally had these attacks, our winter and spring fevers were attended, as a common rule, by much arterial excitement.

After years of suffering and danger, and being in continual dread of renewed assaults by her old enemy, she was advised by one of those knowing old women (a class that generally abounds in neighborhoods in the country) to wear round her neck a string of green glass beads, with a piece of brimstone sewed up in a silk bag, the beads to be strung on a silk thread. [This was about 1801 or 1802.]

The prescription was easily followed, no nauseating drug was to be swallowed, and it would do no harm if it did no good. It was immediately tried, and to the certain knowledge of the present writer no return of the dreaded and dreadful disease ever occurred, though the patient lived ten or twelve years afterwards!

Some years after the beads were put on, the writer of this, a near relative of the patient, and living in the same house, began to practise medicine, and in the course of his practice was often called to see cases of erysipelas. Among these was a young woman, Miss E. M——, whose life had been in jeopardy several times, from erysipelas over the whole face and hairy scalp. After treating her in several attacks, one day the beads occurred to my mind, and I jocularly told her the story of the wise old woman's prescription, and suggested that she should try it.

About two years after this, during which time Miss E. M—— had no return of the disease (a longer immunity, she said, than usually) the writer was again called to see her in the same disease. He was not surprised, being no believer in charms, and had indeed anticipated no prophylactic efficacy from the beads, etc. While tying up her arm after drawing blood, he inquired what had become of the beads, not seeing them on her neck. She replied that a week before she had broken the string and lost the beads, and neglected to get more.

Immediately after her recovery, she procured another string of beads, with the silk bag and brimstone. After eight years of absence (she having removed to another county) the writer met her at the house of a relative of hers, and was informed that she still wore the charm and had had no return of erysipelas since he had attended her eight years previous. These facts are submitted with a perfect knowledge of their truth.

It may be said, and doubtless will be, that the exemption enjoyed by these two patients may be accounted for without referring to the agency of the beads, etc. But the facts brought on a train of thinking on the subject, as a sense of professional duty required.

The poet has said that "there are more things in heaven and earth than are dreamed of in our philosophy," and it soon occurred to the writer that glass, silk, and sulphur are non-conductors of electricity. Now, if the disease in question depends in any degree upon, or is in any way connected (as some of the old professional authorities have suggested) with the electrical condition of the atmosphere, is it not possible that these agents may have a prophylactic influence?

The relations of electricity, that universal something that is known to pervade all space, — the relations of the electric fluid with the animal economy have not been very minutely traced and investigated; and it is possible, nay, very probable, that future discoveries may prove, what heretofore has been only suspected, that the electric fluid, whatever it be, has a large share in producing and regulating the sympathies that are known to exist between the nervous and sanguiferous systems.

The writer ventures to make these suggestions with diffidence. The science of medicine, though three thousand years old, is yet far from perfection; and the best mode of advancing it is, not by vague and mysterious theorizing, but by observing and recording facts. Facts have been called the "touchstones of theory." They are "stubborn things," which cannot be set aside, and ought not to be thrown away.

If further and closer observation should prove that the means above mentioned, which appear so trifling, and *primâ facie* so absurd, are really prophylactic agents, is it not possible that some future Jenner may discover the agent by which malaria may be disarmed of its terrors, the cause of scarlatina and other dangerous diseases may be neutralized, and the time, so confidently predicted by Dr. Rush, may yet come when "old age will be the only outlet of human life?"

The author, in the note which accompanies the above, assures us that during the many years that have elapsed since it was written he has tested this prescription in a large number of instances, and has yet to hear of a single one in which it has failed. In calling the attention of the profession to it, he asks them to attach only its real value to it, but not to judge it too hastily and harshly.

If there is anything in these things — the glass tumblers under the bedstead legs, or the glass beads round the neck — they are therapeutical enigmas yet to be solved. Who will be the Œdipus to explain them?

ALCOHOL: ITS ACTION AND ITS USES.

I.

This is the subject of a series of six Cantor Lectures just delivered before the Society of Arts, London, by Dr. B. W. Richardson. They will doubtless soon be published in book form, and we venture to predict that they will take their place as the most valuable of recent con-

tributions to the literature of this important topic. Meanwhile an abstract of some of the more interesting portions of the lectures cannot fail to be acceptable to the readers of the JOURNAL.

Dr. Richardson began by giving the history of alcohol, which in some form or other was known to mankind at a very early period in their history. Egypt, Greece, and Rome all claimed the invention of wine. The observation of the phenomena of fermentation led naturally to this manufacture. From the juice of the grape the transition was easy to other fruit-juices, thence to juices exuding from trees, as from the Eastern palm-tree, and then to such substances as manna and honey. From fruit, also, it was a short step to seeds, and from succulent seeds again to hard ones of the kind we call grain. From all these sources were produced for centuries different fluids containing alcohol, and all bearing the common name of wine. The lecturer enumerates forty-four Roman wines, and the list by no means exhausts the names of wines of ancient date. These old wines contained a very small amount of spirit compared with our modern wines.

The only diluted rival of wine obtained by fermentation was the liquid derived from corn. Tradition assigns the art of making this product first to the god Osiris, and subsequently to the goddess Ceres. This beverage was afterwards called beer by the Saxons. In its original state beer was what is now called sweet fluid, or wort fresh from the vat, to which no other substance was added. In the ninth century it began to be treated with the hop. Both Henry VI. and Henry VIII. forbade the use of hops, as making the beer unwholesome, but the hops finally won their way.

At length a new process was introduced — that of distilling wine and obtaining from it a spirit containing no water. This discovery has been ascribed to Albucasis, or Casa, an Arabian chemist and physician of the eleventh century; the art undoubtedly sprang from his school. The alchemists were acquainted with pure spirit, and used it in preparing all their secret menstruums. The alcoholic liquors now popular as beverages are more modern. Brandy, from *brennen*, to burn, is a comparatively late term. Gin, from Geneva, was not used two centuries ago. Rum and whiskey were known in chemistry and medicine, but were not used as drinks up to within a century and a half ago.

There were then these four stages in the general history of alcohol: (1) The stage of manufacture of wine or beer by fermentation, extending from the earliest history until about the eleventh century of the Christian era; (2) A stage when there was distilled from wine a lighter spirit called alcohol; (3) A stage when this alcohol was applied to the arts and to science; (4) A stage when alcoholic spirits were produced for the use of man as drinks, under the names of brandy, gin, whiskey, rum — a stage comparatively modern.

The uses of wine and alcohol were next considered. From the first the antiseptic property of wine was recognized, and the Roman butchers used it in preparing their salted meats. Long before the time of the Romans, palm wine was used by the Egyptians in the process of embalming. At a very early period wine was employed for the purpose of extracting the active principles from plants. From the mandrake the ancient Greeks thus extracted a narcotic substance. Some, says Dioscorides, boil the root in wine down to a fluid, part and preserve the decoction, of which they administer a cyathus (about a common wineglassful) in want of sleep, or for severe pains of any part, and also before operations with the knife or cautery, that they may not be felt. Again, he speaks of a preparation of mandragora which causes infatuation and takes away the reason. Pliny bears evidence to the same effects, and adds that some persons have sought sleep from the smell of this medicine. Apuleius says that if a man has to have a limb mutilated, sawn, or burnt, he may take half an ounce of mandragora in wine, and while he sleeps the member may be cut off without pain or sense. It is unquestionably to this wine that Shakespeare refers under the name of "mandragora," in "Antony and Cleopatra," and in "Othello."

In order to verify the truth of these assertions, Dr. Richardson says that he made some mandragora wine according to the directions given in the old writers. This he tested, and found that it had precisely the same narcotic properties that were ascribed to it. He found that it produced in animals a sleep of four hours, and that on awakening there was an excitement like that observed by the ancient physicians.

In the Middle Ages alcohol was used as a solvent of oils, resins, and balsams. From that time to the present the range of its applications has rapidly extended. The spirit-lamp was one result of its discovery, and the arrest of putrefaction was another. Distilled with green vitriol, it yielded sulphuric acid; and in turn with sulphuric acid, ether — that marvellous and potent remedial agent. New ethers followed, as acetous ether, until a numerous series had been obtained. Later on, chlorine passed through alcohol gave chloral hydrate; chloride of lime, with alcohol, furnished chloroform; and other anæsthetic products from the same source are bichloride of methylene, olefiant gas, ethylic ether, chloride of ethyl, bichloride of ethylene, and bromide of ethyl. For some alleviation of physical woes humanity may thank alcohol.

In his second lecture Dr. Richardson went on to speak of the chemistry of alcohol. He referred to the alcohol group of bodies, and described the different alcohols. This was the least original of the lectures, and as it contained little that may not be found in the ordinary manuals of elementary chemistry, we give no abstract of it.

IMPORTANCE OF THE PURITY OF CHLORAL HYDRATE.

DR. OSCAR LIEBREICH has recently published a paper in the *Berliner Klinische Wochenschrift*, in which he calls attention to the important subject of the purity of chloral hydrate, and the effect which its deterioration may produce on the patient to whom it is administered and on its reputation as a remedy. The case, he says, is different from that of such a substance as quinia, the adulteration of which will only reduce, but not pervert, the proper action of the drug. With chloral and other substances prepared by analogous chemical processes, the result of the manufacture may be the formation of compounds which, if administered, produce an altogether different result from that intended. The process of manufacture is one which requires great care; and it seems that it is at least difficult to insure the purity of chloral if made in large quantities. Liebig himself, who discovered it, never attempted to make more than a few grammes at once; and Dr. Liebreich was so convinced, when he brought it into notice as a medicinal agent, that purity was necessary for success, that the first supplies were made under his immediate superintendence. At present it is manufactured in various places, and the result is that in some parts of the Continent, notably in Saxony and Switzerland, it has fallen into disrepute. Dr. Liebreich has made a collection of specimens of the drug used in cases where it has failed to produce its proper action, and possesses, he says, some horrible chemical compounds, which he would not venture to give to a human being. He prefers the crystallized form of chloral hydrate, as the most stable. It may contain hydrochloric acid; this is no disadvantage if the proportion remain the same, but if it increases it indicates that the formation of dangerous compounds may be going on. Sometimes the hypnotic action is increased; this he attributes to the production of chlorine compounds, which are more readily changed into chloroform than chloral itself is. An acid reaction arising from the formation of trichloracetic acid does not show that the chloral is unfit for use, though it weakens its action. In pure chloral this action is limited, while impure chloral is liable to the constantly increasing production of acid compounds — not trichloracetic acid — of a deleterious nature. The German Pharmacopœia is in error in fixing the boiling point of chloral hydrate at 95° C. (203° F.) This is correct for anhydrous chloral, but the boiling point of chloral hydrate is not constant.

ANALYSIS OF THE FRUITS OF *MACLURA AURANTIACA*.

BY DR. H. STIEREN.

THE fresh, half-mature fruits of the *Maclura aurantiaca* (Osage orange), of yellow-green color, I cut up into small pieces. The fruit had a somewhat repugnant, slightly bitter taste, and was pretty watery, the juice leaving blue as well as red litmus paper unchanged.

Having made two entirely different examinations, we will mark them as *A* and *B*.

A, which weighed four ounces, was finely cut up and digested for several days with two pounds distilled water, pressed, filtered, and the residue boiled with two pounds distilled water, set aside for 24 hours, again pressed and filtered. The two liquids, mixed, were evaporated to the thickness of a syrup, and proved to be a mixture of vegetable albumen, a small quantity of chlorophyl, and sugar, from which after a while separated slight salt crystals of rhomboidal form.

The nearly dry residue, after treatment with water, was digested with one pound alcohol of 91 per cent., pressed after a few days and filtered, whereupon it was again treated in the same way with one pound of same alcohol, and the third time with one half pound of alcohol. The three mixed alcoholic liquids were distilled, in the water-bath, to a residue in the glass retort of five to six ounces, which residue was of a brownish-green color. This residue I evaporated to pill-mass consistency, and obtained twenty-five grains of an extract of the deep green color of the extract of Cannabis Indica.

Concentrated sulphuric acid colored this alcoholic extract dark brownish-yellow (aloes color); nitric acid, reddish-yellow, after a while lighter yellow; hydrochloric acid, yellowish-green; caustic potash and soda, as well as caustic ammonia, dirty green (with a strong tinge of blue); perchloride of iron, blackish-green; while basic acetate of lead produced a brownish coloring and subsequent precipitate.

In sulphuric ether this alcoholic extract is insoluble.

B, the second quantity of the fruits, finely cut up, and weighing seven ounces (equal to 3360 grains), was, in the start by degrees, and then in a heat of about 110° C., perfectly exsiccated, after which operation there remained 15 drachms (900 grains) of the perfectly dry fruit, which was, in a crucible, entirely incinerated, and gave 95 grains of ashes, or about 2.8 per cent. of the seven ounces of fruit treated, with the following quantitative result:

Quantitative Analysis of Ashes of the Fruit of Maclura Aurant.

	Parts in 100.
Protoxide of iron	1.14
Manganese	Trace.
Alumina	2.16
Lime	20.40
Magnesia	10.36
Potash	5.00
Soda	14.28
Carbonic acid	20.10
Sulphuric acid	1.50
Phosphoric acid	1.00
Silica	7.00
Insoluble residue	11.50
	94.44

Mason City, W. Va., *April*, 1875.

CINCHONA OR CHINCHONA?

Mr. C. R. Markham, in a lately published Memoir of the Lady Ana de Osoria, Countess of Chinchon and Vice-Queen of Peru, wishes to prove that the name cinchona, applied to Peruvian bark, should be altered to chinchona. The knowledge of the efficacy of Peruvian bark was undoubtedly brought to Europe in the year 1640 by the Countess of Chinchon, on her return to Spain with her husband at the expiration of his term of office as Viceroy of Peru. This lady, during her residence there, was attacked by tertian fever, and cured by the use of Peruvian bark. On the return of the count and countess to the castle of Chinchon, the countess, who had brought with her a supply of the precious bark which had effected such a wonderful cure upon herself, "administered Peruvian bark to the sufferers from tertian agues on her lord's estates in the fertile but unhealthy *vegas* of the Tagus, the Jarama, and the Tajuña. She thus spread blessings around her, and her good deeds are even now remembered by the people of Chinchon and Colmenar in local traditions." Though from time to time during the succeeding hundred years powders of the Peruvian bark were imported into Europe, no scientific account of the tree was published until 1740, in which year De la Condamine published a description and figure in the Memoirs of the Academy of Paris for 1738, under the generic name of *Quinquina*. This communication contained also an account of the history of the drug, wherein the name of the Countess of Chinchon was duly mentioned and properly spelt, and on the information obtained from it and quoted in acknowledgment, Linnæus, in the second edition of his "Genera Plantarum," published at Leyden in the year 1742, founded his genus *Cinchona* in honor of the Countess of Chinchon. The word cinchona, however, as the *London Medical Record* remarks, has now become settled by the usage of upwards of a hundred and thirty years, and sufficiently recalls the name of the enlightened and benevolent lady to whom Europe owes the introduction of this most useful therapeutic agent.

MEDICAL MEMORANDA.

The Physician of the Future. — Dr. H. I. Bowditch, in an article in the London *Sanitary Record*, says: "I contend that the physician of the future will stand higher than ever, as preventive medicine advances. In this statement I take a position exactly the reverse of that *assumed* by President Barnard in his address before the Health Association at its recent meeting in New York. That gentleman quietly informed his medical hearers that their doom was sealed under the steady advance of modern science. Their services would become less and less necessary, and would finally be no longer needed by the laity. I think he is wrong and that my views are correct, because, while human free agency and human imperfection exist, while accidents, moral and physical, occur, there will always be some occurrences tending to injure health, which no skill in prophecy can foresee. The wise physician will therefore be summoned to act immediately on important cases of disease or threatened death. These he will meet not only by wise preventive regulations for the future health of his patient, but likewise by a careful administration of medicine, properly so called, during the actual attack."

Chocolate in Chronic Intestinal Catarrh. — A series of articles from the pen of Dr. Karner have lately appeared in the *Allgemeine Wiener Medicinische Zeitung*, in which he shows the value of this substance as an article of food. He refers especially to its use in chronic intestinal catarrh, and cites, among others, the following typical case of chronic catarrh of the intestines to illustrate its action in the simplest manner: "Rosalia M., aged seventeen months, poorly developed and nourished, suffered from intense meteorism, numerous thin, fluid, feculent discharges, which alternated from time to time with normal stools. There was considerable emaciation, and the child also had intertrigo, of which there were frequent relapses. The diarrhœas could be attributed only to poor nourishment. After strictly regulating the diet, small doses of Dover's powder and acetate of lead were first administered, and in three days were substituted by the chocolate, of which a cupful was given daily. A dessert-spoonful of the powder sufficed for a cup of chocolate. The mother was also instructed to allow the child as little fluids to drink as possible. The result was astonishing. The discharges decreased in number day by day, the weight of the child rapidly increased, and after a few weeks it had perfectly recovered; a remarkable change for the better was observed in its bodily development, and the intertrigo had not recurred."

Physiology and Arithmetic. — Dr. A. W. Bell suggests that a few arithmetical problems of a sanitary character might well be substituted for the meaningless "sums" that are given to pupils in our common schools. Certain practical lessons of the highest importance might thus be taught along with the arithmetic. "We see the wonderful activity with which the functions of life are performed; that within twenty seconds a poisonous gas drawn in with the breath permeates every tissue of the body; that every single respiratory act multiplies the carbonic acid a hundred-fold. No teacher, surely, will fail to appreciate the importance of these phenomena, nor should he fail to teach them to his pupils. A new series of questions in arithmetic should be devised for their inculcation, such as, If half a cubic inch of oxygen be consumed at every respiration, how many respirations will it take to consume 25 cubic feet? If air that has been once passed through the lungs contain five and a half per cent. of carbonic acid, how many volumes of atmosphere will it require to reduce it to four parts per ten thousand? If a single pupil breathes 70 cubic feet of air in four hours, how many cubic feet will be required for 600 pupils seven hours? If a closet of 300 cubic feet capacity requires 2000 cubic feet of air every hour to purify the air sufficiently for one individual, how many cubic feet of air will be required every hour to purify the atmosphere of a school-room $40 \times 35 \times 12$, containing 75 pupils? Many other questions of similar practical utility will readily suggest themselves to the thoughtful teacher."

FOR BURNS AND SCALDS.

Having seen so many valuable formulæ in your excellent journal, I inclose to you one that has been used in Bellevue Hospital, New York, with a great deal of success, for burns and scalds.

White glue	3 viiss.
Water	Oj.

Dissolve the glue in the water by means of a water-bath, and then add

Glycerine	3 ij.
Carbolic acid	3 ij.

This mixture should be kept in a cool place. It is to be used with a brush as an outward application.

Robert L. Davidson, M. D.

FACETIÆ.

Forty Years of Rheumatism and "Remedies." — A doctor was called in East Hartford to a man, sixty-six years old, who was afflicted with rheumatism. "How long have you had it?" asked the doctor. "Forty years," responded the sufferer. The doctor left without prescribing. The *Tribune* moralizes on the case as follows: "We cannot tell how much we should like to see even a partial list of the remedies to which, during his life, our Connecticut martyr has probably resorted. He has carried a roll of brimstone in his left pantaloons pocket; he has carried a bit of magnetized iron in his right ditto; he has floated, so to speak, in pain-killer; he has put his trust in 'camfire,' and likewise in capsicum. Whatsoever things are hot or bracing, or tonic or rubefacient, he has resorted to; to the 'king of pain,' to the 'ready and rapturous relief,' to oils, to ointments, to poor man's porous plasters, to red flannel shirts, to galvanic braces, to opodeldoc, to herbs, and roots, and seeds, — to all things which grow or flow, which are digged from the bowels of the earth, which are extorted from crucibles, which drop from retorts, which are rosy or pale in apothecaries' bottles; to powders, to tinctures, to decoctions, to pills, to essences, to panaceas, and to elixirs; to boluses, and globules, and infinitesimal dilutions; to hot rum and water, to cold gin and sugar, to brandy plain, to sweats and to starvation, to flesh diet and fish diet and fowl diet, — and all in vain."

"Punch" on Holloway's Asylum. — *Punch* furnishes this inscription for the front of the idiot asylum founded by Mr. Holloway, who made his fortune in "patent medicines:" —

> "Not oft is fate so just — see wealth restored
> Back to the simple source from which it poured."

Mexican Bleeding. — Mr. H. H. Bancroft, in the recently published first volume of his work on the aboriginal races of Western America, mentions a quaint custom of a Mexican tribe, which is to medical science what the method of roasting pigs practised by Lamb's mythical Chinese was to cooking. When these ingenious persons wish to bleed a patient, the doctor shoots at him with a bow and arrow, the arrow being guarded at a certain distance from the point, until he has the good luck to strike a satisfactory vein. If our doctors have not learnt how to cure diseases, we must admit that they are able to inflict wounds with a smaller superfluity of injury.

Curiosities of Pharmaceutical Nomenclature. — A Sheffield correspondent of the London *Chemist and Druggist* sends that journal some amusing specimens of the names in written orders sent him by his customers. The following are exact copies of some of them, with the probable interpretations thereof: —

Conservative Roses,	Cons. Rosæ.
Bold Harmony,	Bole Armenia.
Cast Iron Sope,	Sapo Castil.
Linctified Naptha,	Naptha Rect.
Vigorous Turpentine,	Tereb. Venet.
Sweet Nighter,	Spt. Æth. Nit.
Barrax of Hunny,	Mel. Boracis.
Stincho of Rhubarb,	Tincture of Rhubarb.

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Familiar Science.

CHEMISTRY OF EXPLOSIVE AGENTS.

MODERN chemistry has brought to notice several explosive compounds of such extraordinary character that they have produced in the popular mind a great degree of interest. It is true, however, that the number of new explosive compounds which attract public notice is very small compared with the number fabricated by chemists or known to exist. The frightful nature of many of these agents renders them extremely hazardous to handle, and their fabrication is attended with great peril. Such are chloride of nitrogen and iodide of nitrogen. These bodies are so sensitive that a breath of air will explode them with extreme violence. The fulminates of silver and mercury are less sensitive, but slight friction disturbs the chemical equilibrium of the particles, and they detonate with a force which rends asunder everything brought in contact with them.

In a paper recently published by Walter N. Hill, chemist, U. S. Torpedo Station, Newport, R. I., a large amount of interesting information is presented regarding explosive agents, much of which is new. Mr. Hill has been a frequent contributor to the JOURNAL, and we are indebted to him for many interesting facts.

An explosive body must be composed of constituents which will on explosion form large quantities of permanent gas, and they must be so associated that the reaction can be readily brought about, and will proceed with great energy and rapidity. Whenever a solid or a liquid body by sudden decomposition passes into the gaseous condition, great expansive force is developed and explosion results. Nearly all explosive bodies are composed of carbon, nitrogen, and oxygen. The carbon unites with the oxygen to form carbonic acid gas, and the nitrogen is set free in the gaseous condition. Carbon and oxygen readily combine, and the combination is attended with a great evolution of heat, and this heat is an important agent in increasing the force of the explosion. If a gun is charged with an ounce of gunpowder and flame is applied, decomposition at once occurs in the solid grains, the elastic volume of the carbonic acid and nitrogen gases liberated seeks liberty, and, held in restraint by the iron tube, they push before them the shot or bullet with great force, because in that direction there is the least resistance. In addition to the expansive force of the gases, the atmospheric air entangled in the spaces between the grains of powder is greatly heated and expanded, and thus the force of the explosion is augmented by the mechanical energy of the heated air. It will be found that the dull, negative element, nitrogen, is almost an indispensable agent in explosive compounds, and in this fact we have a remarkable instance of the contrarieties of character which some of the elements are capable of manifesting. All the combinations of nitrogen are feeble, owing to the negative nature of the element. With oxygen it combines, but the affinity is so slight that it is readily dissevered in the presence of carbon, and it assumes its naked, elementary condition. In gunpowder we have the nitrogen in the saltpetre used; in nitro-glycerine we have it from the nitric acid employed in the manufacture; in iodide of ammonia, a most explosive agent, we have it from the ammonia. Nitrogen in itself is a harmless body, and although it is capable of holding in its embrace elements which when set free are as terrible as the thunderbolt, it comes out of the most awful concussions simply as nitrogen. Nitrogen serves to closely associate together particles of carbon and oxygen before direct combination takes place, and also it helps in increasing the volume of heated gases produced in explosions.

There are explosive mixtures and explosive compounds, and a distinction should be made between them. Gunpowder is an explosive mixture, but nitro-glycerine is not. In the former, the ingredients are mechanically mixed together, and can be separated by mechanical means; in the latter, the elements are in chemical combination, and cannot be separated unless by chemical change. The ingredients of gunpowder are not explosive when used separately; to obtain explosive force, they must be mixed. There are, however, some mixtures which contain substances in themselves explosive. The salts of picric acid are of this nature. A picrate has a certain quantity of oxygen available in the explosive action, but not enough, so it is mixed with a substance supplying oxygen, such as saltpetre or potassium chlorate. Nitro-glycerine, dynamite, giant powder, etc., are essentially the same thing, and on explosion are resolved entirely into the gases, carbonic anhydride, water, nitrogen, and oxygen. If the explosion is perfect the nature of the decomposition is as above given; but if it is imperfect, oxides of nitrogen are formed, and the force is diminished. When the explosion is perfect no poisonous or disagreeable gases are given off, but otherwise they may be dangerous. The relative force of nitro-glycerine is not easily estimated, as the effect produced depends greatly on the circumstances. Thus a charge of the agent in wet sand, or other soft material, will exercise but a slight effect, while the same charge in the hardest rock will shatter many tons. Roughly estimated, nitro-glycerine may be said to be eight times as powerful as gunpowder, weight for weight.

In future numbers upon explosives we shall consider the nature and uses of nitro-glycerine, dynamite, and other explosive agents which have come into practical employment in modern times.

PLATINUM.

PLATINUM is one of the rarest of the metals that have any applications in the arts, but it is one of the most valuable. The whole quantity produced annually throughout the world averages little more than a couple of tons. As the specific gravity of the metal is over 21 times that of water, the bulk of this yearly product scarcely exceeds that of three quarters of a ton of iron. The amount is comparatively insignificant, but its importance to the chemist is almost incalculable. If any metal may be specially designated as the chemist's metal, platinum is entitled to the distinction. It bears a very high temperature without melting, and is proof against the action of so many acids and other chemical agents that it is invaluable as a material for a great variety of vessels and implements required in the laboratory. The first cost of this apparatus is high, but since with proper care it is almost imperishable, it proves more economical in the long run than much cheaper materials, even in some processes for which the latter could be substituted. For instance, glass retorts can be employed for the concentration of sulphuric acid, but the loss from breakage is so great that in many manufactories platinum boilers are used, notwithstanding their enormous cost. A boiler capable of concentrating daily five tons of sulphuric acid costs in England about $8000, and one for eight tons daily about $12,500.

Though platinum is a rare metal, it is, like gold, very widely diffused. According to Pettenkofer, silver invariably contains a small quantity of it. The chief sources of the metal are the Ural Mountains, whence about four fifths of the whole annual product is obtained, and Brazil and Columbia, which supply nearly all the remainder. Small quantities are got in California, Australia, Borneo, and elsewhere. The metal was first discovered in South America by the Spaniards, who gave it the name *platina* (a diminutive of *plata*, silver) because they supposed it to be an inferior kind of silver. The name was changed to platinum, to make it conform to the modern nomenclature, according to which the names of all metallic elements end in *um*.

In nature platinum is found associated with a number of yet rarer metals, — palladium, rhodium, iridium, osmium, and ruthenium, — which are found nowhere else. It is extremely difficult to separate it from these, and our limits forbid any description of the methods that have been adopted for the purpose. It is a curious fact that the method originally devised by the English Dr. Wollaston is the one employed by the French manufacturers, while the more recent method introduced by two Frenchmen, MM. Deville and Debray, is the one adopted by the great London workers in platinum, who now lead the world in this branch of metallurgy. At the International Exhibition of 1862, this English firm displayed an ingot of pure platinum weighing 280 pounds and valued at about $20,000. Last year an ingot weighing 550 pounds, containing a small percentage of iridium, was made in Paris, which is to be used for standard metre bars.

As already stated, platinum is chiefly applied

to the manufacture of chemical apparatus; but it is employed to a limited extent in other scientific instruments, and also in jewelry in connection with gold and as a setting for diamonds. The fact that it expands with heat less than any other metal has led to its use in dentistry for pins to hold artificial teeth in place. In 1828 the Russian government began to use it for coinage, but in 1845 all the platinum money in circulation, amounting to some 30,000 pounds' weight, was called in, and none has since been issued.

Though platinum resists the action of the most powerful acids (the mixture of muriatic and nitric acids known as *aqua regia* excepted) and is not affected at ordinary temperatures by other chemical agents, it is readily attacked at high temperatures by phosphorus, arsenic, carbon, boron, silicon, many of the metals, the caustic alkalies, and the alkaline earths; so that much care is required in the laboratory in using vessels made of it. An inexperienced manipulator would be likely to find platinum as perishable as many of the cheaper metals.

THE SCIENCE OF ADULTERATION.

BY S. P. SHARPLES, STATE ASSAYER.

V.

THE moment that a man stops doing a thing for himself, and employs another to do it, he generally finds that he has to watch sharply or he will be cheated in some way or other. The spice business is no exception to this rule. In old times, when every one bought spices whole, and ground them at home, they were pretty certain of being what they were called; now they may or they may not.

The first change from the old fashion of selling whole spices was selling ground spices in bulk. But all articles of which the value depends on an essential oil rapidly deteriorate after grinding, if exposed to the air; so the trade was soon forced to put them into tin boxes, bottles, or other close packages. This gives rise to several kinds of frauds. The article may be genuine and of good quality, but short in weight, the box, spice, and all weighing but little, if any, more than the spice alone should weigh. The packers urge, and with some show of reason, that they must be paid for the expense of boxes and boxing, and that this is the easiest way of collecting the money.

The second fraud is selling as a first-class article one that is of poor quality or has been damaged before grinding. The purchaser has no chance of examining the article before purchasing, and must take what he can get. In this connection we have heard much complaint of various herbs that are put up for kitchen use, the users declaring that it took a whole boxful to give any taste to the meat.

But the grinders do not stop with putting up inferior articles; there is a great deal of adulteration beyond this.

Mustard is a favorite article with these gentlemen. Ground mustard has much too pungent a taste to be agreeable if used pure, and as wheat flour is much cheaper, they often get mixed. But this makes it too white, so turmeric is added to color it. Both of these adulterations may be detected by the microscope. Sometimes the manufacturer forgets to put any mustard in, and uses pepper instead. Horse-radish is another similar article that is hard to obtain pure, turnip being the grinder's most profitable crop. Pepper, both black and red, is not always what it purports to be, sawdust colored with Venetian red being made to do duty for cayenne pepper, while rice, flour, talc, and similar substances stand for the black or white. Ginger is regularly prepared in two grades, one of them being largely mixed with turmeric.

A great deal of the adulteration of ground spices is said to have arisen from the practice of certain wholesale dealers demanding the same weight of spice from the mills as was sent to be ground. There is always some waste from dust, husks, and the like, and the millers therefore make up the weight by adding various cheap articles.

The only means that amounts to much in the analysis and detection of adulteration in this class of goods is the free use of the microscope, the samples being thus compared with those known to be genuine. Various authors, chief among whom is Dr. A. H. Hassall, give drawings made with the camera lucida of both the genuine article and the adulterations. These are a great help in the work. In examining these articles with the microscope, it is best generally to moisten them with a little water, and then cover with a thin cover. In this way the structure is usually much better brought out than when the substances are examined dry. Polarized light will also frequently be found to be of value in this examination.

AN EXPERIENCE WITH CHLORINE.

DR. A. B. GRANVILLE, in his Autobiography, recently published in England, gives the following account of an accident that occurred while he was lecturing on chemistry in the Westminster Hospital Medical School: —

I had prepared and carefully collected, in the presence of my class, a considerable volume of chlorine gas in a globular glass vessel, when the assistant on my right hand had occasion to pass something over to "George," whose fat hands were too clumsily shaped to keep fast hold of the proffered object. It fell into the glass recipient, breaking it, as a matter of course, and releasing the imprisoned gas, which went straight into the nostrils of the lecturer, who thereupon fell like a lump of lead to the ground, alarming not a little the whole class, which happened to be numerous. The first who rushed to my assistance raised and placed me on a chair, windows were thrown open, cold water was poured on my head, liquid ammonia exposed under my nose, and a glass of brandy poured down my throat — the whole process ending in my recovery, but completely deprived of my sense of smell, which I have never recovered since. Some readers may feel disposed to exclaim, "So much the better for you, doctor, who will have to go through so many unsavory matters." "True! but how much more shall I miss the smell of the rose!"

I shall only add another trifling physiological fact, from its curiosity, and also because I have never been able to explain it to my satisfaction. It was about ten years after the chlorine accident, and of the deprivation of my sense of smell, that driving with my wife towards Harrow, and while passing what were then fields celebrated for carpet-beating, but now crowded with houses and streets, I became suddenly sensible of the delicious smell of new hay, which was in the process of being made that day. I pulled up my horse, and remained some time perfectly enchanted with delight (I don't exaggerate) at my recovered sense. We remained nearly an hour motionless, and I drove off towards Harrow, proposing to come back the same way at sunset, hoping to enjoy again the same delicious sensation. In this, however, I was disappointed; nor have I ever enjoyed it since.

WALKING AS AN EXERCISE.

DR. H. I. BOWDITCH has been writing a series of articles for the London *Sanitary Record* on "Health and the Means of Preserving It." In the third paper, which is devoted to "Exercise," after enumerating the principal kinds, as walking, running, dancing, horseback riding, driving, gymnastics, boxing, bowling, rowing, and swimming, he goes on as follows: —

Of these the most universally applicable, and usually the best form of exercise is walking. Unfortunately our climate, with its snows and intense cold in winter and equally intense and depressing heat in summer, prevents all of us from walking as much as would be useful, or as much as can be done in some other countries throughout the year. Whenever it is feasible, it probably exercises the whole body better than any other method. It becomes, however, very uninteresting, even in a large city, if made simply for health's sake. Therefore it is always well to combine with it another object, either of business or of pleasure. Hence a profession that will compel out-of-door exercise is the best prescription one can give. I have in recollection now a case of a naturally feeble man who had very decided signs of pulmonary disease, with bleeding from the lungs. He was a newspaper-carrier when he called to see me after one of his bleedings. I feared, at that time, that exposure during the winter would be very pernicious and perhaps fatal to him. Under this exercise, however, taken daily in rain and storms of all weather, and by the use of cod-liver oil, he wholly recovered. Those of my patients who have most frequently recovered are they who, by advice, commenced years since, and still continue, several times daily, their "constitutional" walks around the "Common" in Boston (about a mile). They will continue to do so while they live, because they know from experience now that not only their health, but their real comfort, depend upon a strict attention to that course. Omission of that exercise for a single day perceptibly affects them unfavorably. Two more obvious advantages arise from this course: —

1. Every muscle in the body is gently and uniformly brought into action by the swing of the legs and arms, and consequently of the trunk in a vertical direction. The undulations made by the head, chest, and abdomen in a vertical plane are thus not only according to "Hogarth's line of beauty," but also in that tending to perfect health. Every internal organ is gently stimulated to more robust action. The circulation goes more freely and uniformly.

2. Never, in a common walk, does a person breathe twice the same air, because he is constantly changing his position. This fact alone is of incalculable advantage. Some writers contend that the re-breathing of air once partially used is one of the most fertile causes of consumption.

The most favorable time for walking is undoubtedly about midday in winter, and in the morning and towards evening in the summer. Late in the evening is less useful, because of the liability to dampness and coldness, and absence of the sun's rays, which of themselves seem sometimes to put vigor into the animal frame, and their absence is correspondingly felt in a depression of the powers.

Nevertheless, one cannot deny that there is a great energy sometimes given by a brisk walk in a cool, dry, starlight or moonlight night, when the atmosphere seems not only free from all chilling moisture but absolutely pure and infinitely exhilarating.

SCIENTIFIC BREVITIES.

Proportion of Oxygen in the Air of Various Regions. — In the Austrian *Journal of Meteorology* Dr. Ucke, of Samara, gives some interesting facts under this head. Samara is in 34° N. lat. on the Tigris, and although it is on the open steppe, and exposed to great vicissitudes of temperature, it is a place much frequented by invalids, and consumption is hardly known there. Dr. Ucke thinks this may be due to the greater amount of oxygen inhaled in a given time at Samara as compared with that available at other stations. He finds great difficulty in obtaining materials for comparing this climate with that of other health resorts, owing to the deficiency of published observations for such places, but finally he takes seventeen stations, situated for the most part in Europe and Asiatic Russia. The amount, in pounds, of oxygen passing through the lungs in a week varies from 200 lbs. at Barnaul, to 167 lbs. at Seringapatam. London has 192 lbs., while the Central European stations and those at a high level give lower figures.

Excluding the three Indian stations, Sitka, and the mountain station Peissenberg, in Bavaria, the remaining twelve places are divided into four groups which give the following results as to the yearly amount of oxygen in pounds: Siberia, 2385; Eastern Europe, 2326; Western Europe (Brussels and London), 2305; Central Europe, 2272. Practically, therefore, rather more than a ton of oxygen is inhaled by every one in a year. The amount of oxygen is increased by high barometrical pressure, and reduced by high temperature and humidity.

Living Cells Imitated. — A recent number of *Der Naturforscher* gives an account of experiments made by Herr Moritz Traube on what he calls "inorganic cells," which were suggested by Graham's discoveries in dialysis. If a drop of gelatine solution is acted upon by gallic acid, so that a film of a leathery substance is formed round it, an artificial cell is produced; and this when placed in a weaker solution of gelatine will swell and exhibit a physical growth through the endosmose that takes place. Cells with these artificial membranes will have a tendency to thin out at the top, their lower parts being thicker from the downward gravitation of the particles, and as fresh fluid enters by endosmose the weakest part will be most stretched. The existence of these conditions in plant-cells will favor their upward growth. Herr Traube succeeded in forming cells of different materials, and in imitating many physical processes of growth. The enlargement of the cells in his experiments differs materially from the extension of a soap-bubble by blowing more air into it. He observes phenomena of intussusception analogous to those of plant-cells. The enveloping membrane of his cells is formed by chemical precipitation, which stops when the membrane thickens, and its interstices no longer allow fresh molecules of the membrane-forming material to enter. Endosmose of the surrounding fluid into the cells swells them, stretches their membranes, enlarges the interstices, and allows fresh material to enter, and a new layer of membrane to be formed. Thus far they imitate living cells.

A Long Voyage for a Bottle. — A short time ago one of the hermetically-sealed bottles in wooden cases which were thrown overboard during Prince Napoleon's North-Polar Expedition, in 1860, was picked up at the mouth of the Seine, near Havre. Wooden-covered bottles of this kind were thrown into the sea daily in the month of June of that year, from the prince's ship, in the expectation that the course taken by them would lead to the elucidation of the direction of the greater oceanic currents, but during the nearly fifteen years that have intervened since then, none of these bottles have been seen till the present one was washed ashore. Its appearance at the mouth of the Seine seems to indicate that a polar current must be borne into the German Ocean, and must be carried thence through the English Channel to the western coasts of France.

Brimstone versus Fire. — The use of sulphur as an aid to combustion is natural enough, but to employ it in antagonism to that process will strike many persons as a novel idea. *Les Mondes*, however, suggests that brimstone should be carried on board every ship, for use in case of fire. Half a hundred weight of brimstone would be amply sufficient to abstract the whole of the oxygen from 3500 cubic feet of air, thus rendering it unfitted to support combustion. In a closed space, like a ship's hold, the sulphurous gas produced by the burning of the brimstone would penetrate where water from the decks could not be brought to bear, and the density of the gas would prevent its rising or spreading, if pains were taken to close the hatches carefully with wet sails, etc. It is suggested that the brimstone should be made up in the form of large matches, the ends of which should be passed through scuttles prepared for them in the decks or bulkheads in case of need.

NATURAL HISTORY NOTES.

The Largest of Fishes. — In *Land and Water* we find an interesting account of a fine specimen of the "basking shark" (the *Squalus maximus* of Linnæus, the *Selachus maximus* of Cuvier) which was lately stranded on a ledge at the Isle of Wight. This, as Mr. Frank Buckland remarks, is "the largest of true fishes;" for of course every schoolboy nowadays knows that whales are not fishes but mammals, like human folk themselves. The shark in question measured 28 feet 10 inches in extreme length, and 15 feet around the body. The head was 6 feet 10 inches long; the upper jaw 3 feet 2 inches long, and the lower one 2 feet 4½ inches. The pectoral fins were 5 feet 6 inches long, and 2 feet 4 inches wide. The skin of the monster was half an inch thick, and weighed 2408 pounds. It was purchased for the British Museum. The estimated weight of the entire fish was about 18,000 pounds. Specimens somewhat larger (32 and 33 feet long) are reported, but the measurements are not so trustworthy as the above, which were made by Mr. Buckland himself.

Canine Sagacity. — Dr. W. F. Atlee writes to the *Philadelphia Medical Times* as follows: —

"In a letter recently received from Lancaster, Pa., where my father resides, it is said: 'A queer thing occurred just now. Father was in the office, and heard a dog yelping outside the door; he paid no attention until a second and louder yelp was heard, when he opened it, and found a little brown dog standing on the step upon three legs. He brought him in, and, on examining the fourth leg, found a pin sticking in it. He drew out the pin, and the dog ran away again.'

"The office of my father, Dr. Atlee, is not directly on the street, but stands back, having in front of it, some six feet off, a stone wall with a gate. I will add that it has not been possible to discover anything more about this dog.

"This story reminds me of something similar that occurred to me while studying medicine in this same office nearly thirty years ago. A man named Cosgrove, the keeper of a low tavern near the railroad-station, had his arm broken, and came many times to the office to have the dressings arranged. He was always accompanied by a large, ferocious-looking bull-dog, that watched me most attentively, and most unpleasantly to me, while bandaging his master's arm. A few weeks after Cosgrove's case was discharged, I heard a noise at the office-door as if some animal was pawing it, and, on opening it, saw there this huge bull-dog, accompanied by another dog that held up one of its front legs, evidently broken. They entered the office; I cut several pieces of wood and fastened them firmly to the leg with adhesive plaster, after straightening the limb. They left immediately. The dog that came with Cosgrove's dog I never saw before nor since."

Mosquito Nets in the Olden Time. — According to a correspondent of the *Academy*, mosquito nets are no modern invention, but were known in England three centuries and more ago. There was a "bedstead with a net for knatts" in the new chamber at Sawtre Abbey, when an inventory of the goods of that establishment was made at the time of the dissolution of the monastic corporations in 1539; and similar notices are to be found in several writers of that period.

Bartholomew Glanvil, in his "De Proprietatibus Rerum" (Trevisa's version) has a chapter in which he tells, with the deep feeling of one who had evidently suffered much, how —

"A gnatte is a lyttell flye" that "soucketh bloudde, & hath in his mouthe a pype like a prick, and there with he percethe the flesche for to soucke the bloudde. . . . And is gendred of rotted or corrupt vapours of caraynes and corrupt place of marreys. By continualle flappynge of wynges he maketh noyse in the ayre as thoughe he hurred . . . and greueth slepynge men with noyse and with bytynge, and waketh theym of theyr reste, and fleeth aboute moost by nyghte, and perceth and byteth membres vpon whiche he sitteth."

HINTS FOR EXPERIMENTS.

To Illustrate the Combustibility of Iron. — A German professor does this by means of a bar magnet of considerable power, upon one of the poles of which he sprinkles iron filings. These arrange themselves in accordance with the lines of magnetic force, and, however closely they may appear to be placed, of course no two of the metallic filaments are parallel, and consequently a certain portion of air is inclosed as in a metallic sponge. The flame of any ordinary spirit-lamp or gas-burner readily ignites the finely divided iron, and it continues to burn most brilliantly for a considerable length of time, the combustion being apparently as natural and easy as that of any ordinary substance. If the magnet be waved to and fro, a magnificent rain of fire is said to be produced.

Liquid Phosphoretted Hydrogen. — The following is one of Prof. A. W. Hofmann's experiments: A thick-walled U tube, about one seventh of an inch in diameter, and provided with a stopcock on each arm, is surrounded by a freezing mixture (—16° to —20°), and receives the phosphoretted hydrogen prepared from 7 to 10 drachms of freshly made calcium phosphide. A wide glass tube in the cork of the generating flask, dipping beneath the surface of the water (at about 60°), serves for the introduction of the phosphide. While the liquid is being collected, spontaneously inflammable phosphoretted hydrogen escapes; if this is displaced by a stream of carbonic acid, the bright flame is replaced by a scarcely luminous green flame, of so low a temperature that a taper cannot be lighted at it. This flame is caused by the liquid phosphoretted hydrogen in the stream of carbonic acid coming in contact with the air. The carbonic acid may be replaced by a stream of some combustible gas, for example, hydrogen, and a luminous flame again obtained.

Practical Chemistry and the Arts.

THE MOTOR FORCES OF THE FUTURE.

ALTHOUGH we often read in the newspapers of the discovery of a new motor which is to reduce the value of all the steam-engines in the world to what they may be worth as old iron, we have no idea that these useful machines, to which our modern civilization is so immensely indebted, are to be superseded in our day and generation. But already John Bull is anxiously figuring upon the problem of the possible exhaustion of his coal supply within a few centuries, and, whether that evil day can be accurately foretold or not, it is certain that it must come at last; and the coal fields of our own country and the rest of the world cannot hold out forever. Meanwhile we had better be thinking what we, or our descendants in that far-off future, are to do when the steam-engines stop for want of fuel. Even now it may be worth while to inquire whether sources of power may not be found that are cheaper than steam, or that are preferable to it on other grounds, at least in certain localities.

Already much investigation and much inventive talent have been devoted to the utilization of electricity as a motor, but thus far with no important practical results. Electrical engines of various forms have been devised, and there is no difficulty in making them work, but unfortunately zinc is a costlier fuel than coal, and the battery or other means of supplying the electric force is yet to be invented that can be an economical substitute on a large scale for the steam-boiler. That some Watt of the future will teach the world how to make electricity do its drudgery as cheaply as steam now does it, is less improbable than many applications of science to modern industry would have appeared a hundred years ago; and we have no doubt that our children will live to see such a result, even if we ourselves are not so fortunate.

Another probable motor of the future is solar heat, which the science of our day has shown to be the source, direct or indirect, of all terrestrial energy. We may confidently expect that some small fraction at least of the vast amount of solar force that now runs to waste, so to speak, will be made available for purposes of human industry. It has been calculated that the earth receives from the sun, *every minute*, 2247 billions of units of heat, each unit being equivalent to 772 foot-pounds, or the force that will raise a pound to the height of one foot. Capt. John Ericsson is one of those who are endeavoring to devise some means of utilizing a portion of this enormous energy, which is literally free as the sunshine to him who will take it and employ it. In a recent paper describing the main features of a solar engine which he is elaborating, he says: "Regarding the solar engine, I avail myself of this opportunity to say that I shall not apply for any patent rights, and that it is my intention to devote the balance of my professional life almost exclusively to its completion. Hence my anxiety to guard against legal obstructions being interposed before perfection of detail shall have been measurably attained. Within a few years the entire engineering community of both hemispheres will be invited to take the matter in hand. In the mean time let us hope that no exclusive privileges may be granted, tending to throw obstacles in the way of an unrestricted manufacture and introduction of the new motor wherever it may be applicable."

Another inventor, who, as we learn from the *American Exchange and Review*, is at work on the same problem, is Mr. Bergh, a German engineer. He proposes the following construction for a solar engine: Conceive a vessel filled with sulphurous acid, and exposed to the sun's rays. The tension of the sulphurous acid vapor, if the temperature of this vessel exceeds that of the surrounding air by at least 10° to 20°, must be from one to three atmospheres higher than that of the sulphurous acid vapor in another vessel, B, similarly filled with sulphurous acid, but which has only the temperature of the surrounding air. We can thus arrange an engine which agrees perfectly in principle with the steam-engine, with merely the difference in detail that the water is replaced by sulphurous acid, and the fuel by the solar heat; while the vessel exposed to the sun's rays represents the steam-boiler, the vessel kept at the ordinary temperature may represent the condenser. The sulphurous acid condensed, after doing work in vessel B, could easily be driven back by a force-pump into the vessel A, which represents the boiler. The capability of work which such a machine will possess will, of course, increase with the amount of heat communicated to the vapor generator A; or will be proportional to the vaporizing surface which it exposes to the solar rays. In applying this construction in practice, Mr. Bergh proposes that the roof of a factory or workshop shall be covered with vessels containing sulphurous acid, the other parts of the sun-machine being disposed as may be found most convenient.

Under such circumstances the engine would work *while there was sunshine*, but in cloudy weather the establishment would be brought to a stand-still. To obviate this difficulty, there might be, in addition to the sun-machine, an apparatus for "storing up" a portion of the work done by the former. For this purpose Natterer's well-known apparatus for liquefying carbonic acid is suggested. A supply of carbonic acid should be kept in a large gasometer, like those of the gas-works, from which the Natterer apparatus could be fed. In a wrought-iron vessel, thus filled with liquid carbonic acid, an enormous amount of mechanical energy could be stored up, which might be made to replace either wholly or in part the action of the solar heat in the sun-machine.

There is certainly nothing in the plan here proposed that is visionary or impracticable, and therefore there is one form of sun-engine capable of continuous action, by appropriate devices, that can be made available in many portions of the world.

It was our intention to refer to other possible applications of the surplus energy of the natural world, but the length to which this article has extended compels us to drop the subject here, at least for the present.

MEMORANDA IN THE ARTS.

A NEW KIND OF POISONOUS DRESS GOODS. — Professor Gintl says that in some English and Alsatian print works the expensive albumen is partially replaced by glycerine-arsenic and acetate of alumina. Some of the dress goods in the market contain three or four grains of arsenic in a yard of the stuff. Muslins and cambrics with little white spots, circles, stars, or flowers on a violet ground, and those printed with brownish yellow or reddish brown patterns, have been found to contain arsenic; and these are colors which have never before been considered with any suspicion, and would be purchased by the uninitiated without any foreboding of the danger that would attend the wearing of such dresses. The danger, as the *Manufacturers' Review* remarks, is no slight one; for aside from the large quantity of arsenic in it, the compound is not an insoluble one. If the goods are soaked in water, there is dissolved out a sufficient amount of arsenical salt to give a distinct reaction. This latter peculiarity is explained by the supposition that the goods, being comparatively cheap, are not washed or rinsed after printing, but sent directly to be finished.

CONCERNING SOAP. — The first soap-boiling factory in London was established by one John Lamb, dwelling in Grass (since called Gracechurch) Street, about the year 1650, previous to which time — as Pennant says — London was supplied with Castle (Castile) soap and other soaps from beyond the seas, imported in hard cakes. The commoner kind, called gray because speckled, or as we say mottled, was then sold at a penny per pound, and the black soap which came from Bristol was sold at half that price. The first mention of soap in ancient writings occurs in Pliny and Galen. The former describes it as an invention of the Gauls, and expresses a preference for that made in Germany.

WOODEN SPOONS IN RUSSIA. — In a work on "Domestic Industry in Russia," M. Weschniakoff states that thirty millions of wooden spoons are annually made in that country. The district of Semenow is the centre of this industry. Poplar, aspen, maple, and box are the woods used for this purpose. Wooden spoons cost from about $5 to about $20 per thousand. The first operation consists in cutting the wood into the proper lengths, and making these up into bundles. These bundles are sold in the markets, and are often procured from long distances. The second stage is forming the bowl of the spoon; the third, shaping the handle; and the fourth and last, dyeing them of a yellow color.

PUDDLING FURNACES. — Sir Humphry Davy demonstrated in a public lecture that a flame of very high temperature could be produced which contained no free oxygen, so that bodies could be heated in such a flame without fear of oxidizing them, by simply limiting the supply of air to an abundance of fuel. A young man named Cort was in the audience, who caught the idea of decarbonizing pig-iron by allowing the flame to play upon it without bringing it into contact with the coal, and for this purpose he devised the puddling furnace. Before his time cast iron was converted into wrought iron by blowing air through the mixture of pig-iron with charcoal. This process was very expensive and wasteful, so that only small quantities were produced, and the iron was costly. The latter improvement of mixing the melted pig with oxide of iron, in the form of scales or iron ore, was very important, as then a double reduction takes place, the iron of the ore being as well reduced to wrought iron as that of the pig-iron; the carbon of the pig-iron, combining with the oxygen of the oxide of iron, escapes as gaseous carbonic acid and swells up the mass of reduced wrought iron like a sponge, forming the so-called puddling-ball, which, after being rolled around in the melted cast iron by the puddler, so as to collect all solid iron, is removed to the squeezer, where all slag and cast iron remaining in the pores are pressed out, while the resulting solid mass is passed through the rollers and becomes bar iron or rails. The mechanical puddling furnace invented by Danks has not thus far found general acceptance.

A Novelty in Ornamental Silvering. — In Munich various objects of art have lately been displayed, which are remarkable for their brilliant silver hue. It appears that they are mere plaster models covered with a thin coat of mica powder, which perfectly replaces the ordinary metallic substances. The mica plates are first cleaned and bleached by fire, boiled in hydrochloric acid, and washed and dried. The material is then finely powdered, sifted, and mingled with collodion, which serves as a vehicle for applying the compound with a paint-brush. The objects thus prepared can be washed in water, and are not liable to be injured by sulphuretted gases or dust. The collodion adheres perfectly to glass, porcelain, wood, metal, or *papier maché*. The mica can be easily tinted in different colors, thus adding to the beauty of the ornamentation.

Submarine Railway for the British Channel. — We learn from *Iron* that, in addition to the schemes for tunnelling and bridging the Channel, a most extraordinary proposal, made by a Dr. Lacomme some five or six years ago, has been again brought forward. Dr. Lacomme's project might, perhaps, be more fittingly termed a marine railway, or a railway for the marines. He proposes to lay a submarine line of rails at the bottom of the sea, upon which a weighted chariot or platform is to run, and upon this platform is to be placed a submarine boat, composed of galvanized iron and hermetically sealed, propelled by compressed air and furnished with the same fluid in a condensed state for the use of the passengers. There is provision for renewing the supply of air from the surface in case of accident, and, half-way, for a submarine station on the same plan as the ship, which will probably become a favorite place for fish dinners. Dr. Lacomme claims several advantages for his plan over all others, several of which are, it must be confessed, self-evident. The passengers, for instance, will not suffer from fogs or the east wind. They will be able also to appreciate to some extent the position of the prophet Jonah, while most readers will at once admit that the doctor's boat is very like a whale.

PRACTICAL HINTS.

Amalgamating Battery Zincs. — The London *Telegraphic Journal* quotes with commendation the following from Du Moncel's "Applications de l'Électricité." "Several methods have been proposed for amalgamating zincs; but the simplest and quickest is that of M. Berjot (a chemist at Caen), which consists in immersing the zinc in a liquid composed of nitrate of mercury and hydrochloric acid. A few moments is sufficient for the complete amalgamation of the zinc, however soiled its surface may be. With a litre of this liquid, which costs less than two shillings, 150 zincs can be amalgamated. The liquid should be prepared in this manner: Dissolve in warm water 200 grammes of mercury in 1000 grms. of aqua regia (nitric acid 1 part, hydrochloric acid 3 parts). When the mercury is dissolved, add 1000 grms. of hydrochloric acid."

Bunsen's Batteries. — A correspondent of an English journal says: "I give the outside of the zinc cylinder a coating of varnish or paraffine, which prevents the acid from attacking that surface, and as the available negative electricity is only produced on the inner surface, the power of the battery is not diminished; the zinc thus lasts twice as long as it would otherwise. This may not be new, but I have never seen it mentioned."

Preservation of Rope. — The following process for preserving rope has been patented on the Continent: The rope is steeped in a solution of 600 grammes of sulphate of copper, 200 grammes of sulphate of zinc, and 30 grammes of glycerine evaporated to dryness, the whole mixed with 24 litres of boiling water in a close vessel.

Agriculture.

FISH CULTURE.

Fish culture is not agriculture, but the pursuit is so closely allied to it that farmers ought to take a deep interest in the matter, and if possible obtain some of the benefits resulting from it as a profitable industry. A large number of farmers have upon their lands streams and ponds which might be made to yield an annual harvest of fish of greater cash value than any which fields are capable of producing. At the present time great interest is felt in fish culture, and its success is so fully assured that no one can doubt who examines the subject.

O. Whitney, Esq., of Ashburnham, Mass., stocked with fish a pond in that town last year, and he presents in a report some interesting facts regarding his labors and their results. The pond is a beautiful sheet of water of about five hundred acres in extent, and being fed by springs the water is remarkably clear and cool. He presents the following account of the work of stocking the pond, and the habits of the fish introduced: —

After corresponding with and getting what information I could from others, I decided to attempt to stock the lake with land-locked salmon, salmon trout, and black bass, and in accordance with this plan obtained from Mr. Commissioner Brackett some four hundred and fifty land-locked salmon fry, which were transported in fine order, and are thus far growing well, and I trust will be in good condition to put into the lake next autumn. I also obtained from Mr. Seth Green, one of the New York commissioners, some six hundred salmon trout spawn taken from Lake Ontario, which were hatched out in my private hatching troughs and kept until they were in condition to take care of themselves, and were then put into the lake. On the 15th of May last, after some correspondence, I received from Livingston Stone, so favorably known in connection with the fish movement throughout the country, forty-six Lake Champlain bass, and on the 23d day of the same month fifty-four more, which were immediately put into the lake in capital condition. They were fine specimens of this variety of fish and weighed from two to five pounds each, the females being heavy with spawn.

It is, of course, now too short a time in which to present any data as to the success of the enterprise. Occasionally during the year the lake was visited for the purpose of watching any movements which the fish might make. During the spawning season I was rewarded by finding them upon their nests, and later saw them frequently swimming about in shallow feeding grounds.

THE HABITS OF BLACK BASS.

They pair and spawn in May, make their nests on beds of coarse sand or gravel, in from four to six feet of water, by fanning the pebbles clean and smooth with their fins and tails, and then deposit their eggs. Two or three weeks, according to the temperature of the water, elapse before the eggs hatch. The hatching is almost instantaneous, the young coming out a perfect fish about half an inch long. After hatching, the young remain several days over the spawning beds, while the old ones keep close by to protect them. In about a week the young scatter, mostly into deep water, and are not seen again until September, when they come inshore, having grown about two inches in length. If well supplied with food, they grow about four inches the first season. When two years old they reach a pound in weight, and after that grow about a pound each year, until they weigh six or eight pounds.

They are, moreover, enormously prolific, a fish yielding from twenty to thirty thousand spawn to the pound.

The bass is a gamey fish; when hooked he dives to the bottom, then turns and rushes like an arrow to the top, sometimes leaping three or four feet into the air, then plunges down again, shaking and twisting, bending and often breaking a stout pole like a reed, or snapping a silk line like a mere thread. After three or four plunges he becomes exhausted, and may then be hauled in. The manner of fishing for black bass is with the fly or by trolling with a long line, though sinking in ten or fifteen feet of water, with worms or minnow for bait, is a favorite method with some, particularly in autumn fishing.

THE HABITS OF LAND-LOCKED SALMON.

It is perhaps not necessary at this time to speak of the habits of the land-locked salmon, further than to say that their spawning season is late in the fall; from one hundred to one hundred and fifty days are required to hatch them, according to the temperature of the water. The fry have a sac attached to their belly, containing food which the fish gradually absorbs (as is the case with all winter spawning fish), the duration of which, like that of the egg period, depends on the temperature of the water, lasting from one half to two thirds the period of incubation. During this period they require no other food, will accept of none even, but hide themselves from view in crevices of rocks and under them, or between the pebbles at the bottom, and only desire to be severely let alone. As the sac disappears the young fish get larger and stronger, begin to rise from the bottom, and swim about in search of food. They sometimes grow to fifteen or twenty pounds in weight, and are said to be the best fish in the world, and afford the greatest sport to the angler.

BENEFITS TO BE DERIVED.

From the time a fish is hatched and turned loose in a pond or stream, he obtains his own food. Some species live on the product of vegetable matter, being the only harvesters of the fields of the sea. But few of these are fit for human food, though they serve as support for more desirable varieties. On the land grain and grass are grown to feed cattle, which are converted into food for the human race. In the water the same course may be pursued, or it may be carried a step further. The product of water plants may be consumed by inferior fish, which in their turn become the prey of larger and more valuable kinds.

Where one sort of grain or vegetable is repeated on the same ground, it exhausts the soil, while its enemies are augmented in number. So with fish. When they are kept in one locality, they use up their food and the list of their foes increases. When this happens they suffer, and should be supplanted by some other species requiring different food and having different enemies. Whenever this has been done the result has been highly remunerative, the species thriving and increasing wonderfully. Fish culture is an industry that is rapidly developing. In it may be found a pleasant and profitable occupation, in turning the rivers and ponds, which nature has so lavishly provided for us, into as prosperous sources of wealth as are the fields which give us their annual products of grain and vegetables.

In ancient days the land yielded sufficient roots and fruits for the wants of its population without cultivation, but as population increased, and larger supplies became necessary, cultivation was tried, and now in all countries the culture of the land is one of the main employments of the people. The lakes, too, must be cultivated, and the rivers also, if we desire to multiply or replenish our stock of fish.

IRRIGATION.

One of the most serious obstacles encountered by husbandmen in this country is drought. In our excessively hot summers there is usually a great deficiency of rain, and crops suffer to an enormous extent. There are but few who practise irrigation, although many farmers have facilities for retaining water and turning streams upon their lands when a parching drought prevails.

There is not the slightest doubt that irrigation might be carried on much more extensively than it is, and that, too, with profit. Our country is intersected with a net-work of streams and rivulets, and only the skill of man is needed to turn the water to a useful purpose. The amount of water, however, required to irrigate an acre of ground in the hot summer months, when rain has been withheld for several weeks, is enormous. If the means of irrigation are at hand, it is not well to allow a field to become parched before water is let on, as in this case the advantages are in a measure lost, and the labor greatly increased. We have had some experience in irrigating vines, and this experience leads us to suggest that no more than two or three days should elapse after a rain before water is allowed to flow in moderate quantities, and two days later more should be applied. The intervals must not exceed two days in hot weather, and by this management the earth is kept in a retentive and absorptive condition, and plants flourish luxuriantly.

The plan usually adopted in watering plants, flowers, etc., is erroneous, inasmuch as the interval between the rain and the watering-pot is too extended. If one has valuable plants out-of-doors in summer-time, which it is desirable to nourish and sustain against drought, it is better to assume at once that drought is certain, rather than to wait for rain through days and weeks, or months. In a day or two after a rain, watering should commence, and the amount applied need not be large. If the practice is continued every other day, the plants will at no time suffer from either redundancy or want of water, and if the rainfall is scanty the plants cannot suffer as they will if watering is only resorted to when it is absolutely necessary to sustain life.

Water is not alone needed to supply moisture to plants; it is required to render soluble the food in the soil which they consume. The most complex vital changes go on in the soil and in the plant under the influence of water, and if it is withheld for a considerable time a check is experienced which no subsequent supply can remedy.

Irrigation need not necessarily be an expensive undertaking. If a stream can be secured at an altitude, so that gravity will cause it to flow into a cultivated field, the labor of turning it from its accustomed channel may not be great. The subject is worthy the attention of farmers, and we hope many a mountain or hill-side stream will be made in the future to add to the crops on farms in all sections of our country.

A KITCHEN STOVE BOILER.

The editor of the *New England Farmer* describes in a recent number of that journal a kitchen stove boiler which he saw in use on the premises of a farmer in Worcester County. The device is not new, having been in use for at least twenty-five years. We applied a boiler to a stove, and used the steam for warming and cooking more than a quarter of a century ago, and we presume others have constructed similar devices. The object was to save the waste heat resulting from cooking processes, and the end desired was fully reached in our experiments.

There are many advantages in the use of such a boiler, and some disadvantages. Notwithstanding every precaution, the item of danger still remains, especially if servants have charge of the culinary arrangements. Safety-valves will become disarranged, and pipes obstructed, and water-cocks broken. Steam is a good servant, but he will only work kindly when under the eye of the master. Our experience with all kinds of steam devices has been extensive, and we well understand the merits of those suggested by inventors. We have no doubt of the utility of some such arrangement as is described below, but it must be carefully constructed. The writer, after speaking of the parties using the device, proceeds as follows: —

On entering the kitchen we find a common Rhode Island cook stove, made by the Barstow Company, Providence, and having four holes on the top for the kettles, and a good-sized oven in the back part, with the fire-box in the upper front portion. These stoves are made for wood or coal, the coal stoves having a fire-brick lining. In place of the front piece of lining is a hollow iron casting, attached by pipes at either end to the boiler above, from which the water is drawn in at one end, heated, and forced out at the other by an inclined plane into the boiler again. On the rear half of the stove we find an iron boiler, taking up just about the same amount of room that would be occupied by the large tin boiler that came with the stove as a part of its furniture. This iron boiler is made with two steam-tight heads, like the boiler of a locomotive or stationary engine, and contains eight fire-tubes passing up from the stove through the boiler into a sheet-iron cap or bonnet, connecting by flue with the ordinary stove-pipe. Two dampers in the pipe regulate the draught, and by their use the fire may be sent through the boiler or not, at pleasure. Some five inches from the bottom of the boiler is a large faucet for drawing hot water for kitchen use, as wanted. Two other small faucets, at regular spaces above, enable the cook to know the height of the water in the boiler. From the top, a steam pipe starts and runs to the top of the room, and from thence in different directions, wherever steam is wanted. A safety-valve and an inverted valve for supplying air when the steam is condensing in the boilers is attached to this pipe, and by their use perfect safety is secured. From the main pipe steam is carried to a system of radiators set in the sitting-room, on the opposite side of the chimney, which is directly back of the kitchen stove. By the side of the chimney, in a little cupboard-like corner, is hung a galvanized iron box with shelves, on which are placed meats, vegetables, bread, or puddings, to be cooked by steam. From another connection with the main pipe steam is carried at pleasure, through a rubber hose, to any part of the room, or through the window to the piazza outside, where the week's washing or the potatoes for the pigs may be boiled with no annoyance of steam or disagreeable odors inside of the kitchen. As the object of our visit was to see and examine, we took two quarts of cold water in a basin, and, after holding the end of the rubber hose in it less than two minutes, had boiling water.

To show still more plainly the capabilities of the boiler, a tin boiler belonging to the stove was brought out, and after being filled part full of cold water and put directly over the fire on the stove, a like quantity of water of the same temperature was poured into a tub set on a table in a distant part of the room, and the end of the rubber hose placed in the tub. At the end of ten minutes the thermometer was inserted, and indicated a rise of temperature in the tub equal to about three degrees against one in the boiler, showing that if it took an hour to boil a certain quantity of water in the ordinary way over the fire, it might be done with the steam pipe in twenty minutes. The main pipe, after doing duty in the sitting-room, the kitchen, and a chamber in the second story, is carried through the L to the barn loft, where it enters a steam-box large enough to hold a half-day's supply of feed for five animals.

On the floor below is a tub for receiving spring water from an aqueduct, and into this tub the final waste or condensed steam is carried, or it is conveyed still farther, to a pan in the poultry house, thus supplying pure water at a medium temperature to all the stock at all times, with no lifting and but very little care, except to see that the pipes are all in working order and the steam sent where it is wanted.

While we were there a bushel of potatoes were thoroughly steamed from the rubber hose inserted into a barrel covered with an old hay-seed bag and a loose board cover. A splendid dinner for the family was cooked in the cupboard by the chimney, and, at the same time that the water was being heated for dish-washing, the supper for the animals at the barn was being made soft and palatable, and all this without a single pound of pressure being indicated by the steam-gauge, the heating of the several rooms and the cooking, at both the house and barn, being done only with flowing steam at a temperature but a trifle, if any, above 212°; and, what is most striking to the observer, all this amount of business has been carried on through this long, cold winter without, at the time of our visit, April 14th, beginning on the second half of the fourth ton of coal.

NOTES AND MEMORANDA.

Walking *versus* Trotting Horses. — A writer in the *Prairie Farmer* complains that all the premiums offered at agricultural fairs for the performance of horses go for trotting or running and none for walking. He says the various agricultural societies "say nothing of walking, which is the gait farmers are most interested in. I have often wondered why that was overlooked, and had hoped that some one would bring it before the societies. What benefit is a race-horse to a farmer? If he wants to run or trot him for premiums or stakes, it will not do to work him as farm horses have to work. Besides, fast horses, generally, are not able to stand heavy work, and are not apt to be extra walkers. What the farmer wants is a close-made, muscular horse, weighing 1000 to 1200 pounds, that can walk at least four miles an hour with a cultivator, or at that rate while crossing the field. It costs no more for a hand to drive a team that will plough three acres per day, than it would to drive one that would plough only two acres; and a good hand, or one that tries to earn his wages, would."

No English Agricultural Machinery to be sent to the Philadelphia Exhibition. — At a recent meeting of the Association of Agricultural Engineers, in London, the question of exhibiting at Philadelphia was discussed at length, and the following resolution was unanimously passed: —

"That, looking to the prohibitory duties — from 30 to 40 per cent. — imposed by the United States upon English agricultural machinery, the Association of Agricultural Engineers recommends its members to hold aloof from the Philadelphia Exhibition, considering the imposition of prohibitory duties to be out of harmony with the objects of international exhibitions."

The London *Agricultural Gazette* adds: "Members of nearly the whole of the great firms, and of many of the smaller ones, were present, and the feeling was that no good could accrue to the English makers from exhibiting, although it would unquestionably be of advantage to American makers to have our best specimens displayed before their eyes. American machinery can be imported into this country duty free; but as the English agricultural machinery is unrivalled, little beyond a few reapers and mowers is imported from America."

The Supply of Redwood in California. — There may be danger of exhausting the timber supply in some parts of the country, but California is not one of these, if we may depend on recent estimates of the quantity of a single kind of wood. In Sonoma County alone it is estimated that there are 1,000,000,000 feet of redwood, if it were all sawn into boards. The present annual exportation amounts to 20,000,000 feet, so that there is enough to last fifty years, even if there were no new growth obtained. Considerable tracts will average 900,000 feet to the acre, and a single tree has been known to produce 50,000 feet. Humboldt is still richer. The following table shows the number of acres of redwood, the average feet of hard timber per acre, and the aggregate feet in each district.

Districts.	Acres.	Average.	Aggregate.
Eel River Basin . .	100,000	800,000	80,000,000,000
Van Dusen Basin . .	15,000	600,000	9,000,000,000
Salmon Basin . . .	20,000	800,000	16,000,000,000
Elk Basin	35,000	600,000	21,000,000,000
Madand Century . .	150,000	900,000	135,000,000,000
Little River, etc. .	250,000	100,000	25,000,000,000
Eureka, etc. . . .	105,000	200,000	21,000,000,000
Total	675,000		207,000,000,000

The mills of the county now cut about 40,000,000 annually, at which rate they would exhaust the supply in 7675 years. Sonoma and Humboldt together have not a quarter of the fine timber trees of the State, and not more than one per cent. of the stock on the coast west of the summit of the Sierra Nevada and Cascade Range.

New Sources of India-Rubber. — It is well known that rubber abounds in the milky juices of many plants besides the caoutchouc-tree; for example, lettuce and dandelion. A company has been formed in London, Ontario Province, for the extraction of caoutchouc from milkweed, the juice of which contains some four per cent. of rubber. The plant is partially decomposed, steamed, then treated with coal-tar naphtha, which, being distilled, leaves the residuary caoutchouc in the solid form.

Put Flowers on Your Table. — Leigh Hunt says: "Set flowers on your table — a whole nosegay if you can get it, or but two or three, or a single flower, a rose, a pink, a daisy. Bring a few daisies or buttercups from your last field work, and keep them alive in a little water; preserve but a bunch of clover, or a handful of flowering grass, — one of the most elegant of nature's productions, — and you have something on your table that reminds you of God's creation, and gives you a link with the poets that have done it most honor. Put a rose or a lily, or a violet on your table, and you and Lord Bacon have a custom in common, for this great and wise man was in the habit of having flowers in season set upon his table, we believe, morning, noon, and night — that is to say, at all meals, seeing that they were growing all day. Now here is a fashion that will last you forever, if you please — never change with silks, and velvets, and silver forks, nor be dependent on caprice, or some fine gentleman or lady who have nothing but caprice and changes to give them importance and a sensation. Flowers on the morning table are especially suited to them. They look like the happy wakening of the creation; they bring the breath of nature into your room; they seem the very representative and embodiment of the very smiles of your home, the graces of good morrow."

Boston Journal of Chemistry.

Jas. R. Nichols, M. D., *Editor.*
Wm. J. Rolfe, A. M., *Associate Editor.*

BOSTON, JUNE 1, 1875.

SUMMER RESORTS FROM A SANITARY POINT OF VIEW.

Now that so many of our readers are making their plans for the annual *hegira* to sea-side or country resorts, a few words as to the importance of looking into the sanitary condition of the locality selected will not be out of place. Beauty of scenery, and whatever else goes to make up the superficial attractiveness of the place, should not be the primary considerations. Lovely landscapes are well enough in their way, but the risk of typhoid fever is too heavy a price to pay for enjoying them. The blended charms of mountain and ocean at Mount Desert are a rare treat to eyes wearied with the dull monotony of brick and mortar in city streets, but if the air one breathes and the water one drinks while visiting the enchanted island are to be poisoned with sewage, as was the case two years ago, it would be better to stay at home, even at the expense of a little dog-day *ennui*. Lake Mahopac is a delightful spot, but those who visited it last summer found it the haunt of pestilence, and some of them forfeited their lives by venturing upon its fair but fatal shores.

This state of things is becoming worse and worse every year, with the increasing throng of visitors at these summer resorts. The trouble is that at many of them no proper provision is made for the sudden influx of transient population. A house of a given size may be a healthful abode for a given number of inmates, but crowd it with sevenfold that number and it becomes unfit for habitation. So the sanitary condition of a sea-side village or country hamlet may be unexceptionable with its regular population, but may become far from satisfactory when the place is crowded with summer boarders. The good people of these resorts must make proper provision, in the way of sewerage and other sanitary conveniences, for the changed conditions of the visiting season, or they will find in a few years that the visitors will be frightened away. Nature has favored them in the beauty with which she has surrounded their homes, and with pure air and pure water as well; but if her great laws are violated, she will none the less exact the penalty. If they are so greedy of gain that they will not keep air and water pure, but permit these to become sources of disease and death to the stranger within their gates, they will find it in the long run a ruinous policy. Let them be wise in time, and not kill the bird that lays the golden eggs.

We need hardly say that it is not alone at places of great resort that the summer pilgrim is in danger. The isolated farm-house may be as objectionable on sanitary grounds as the overcrowded village. If, for instance, the well and the cess-pool, as often happens, are simply "two holes in the ground side by side," those who sojourn there for a season do it at the peril of their lives. The natives, toughened and hardened by country habits, may have imbibed the poison with impunity, but the stranger from the city had better not run the risk. He should beware of staying there himself, and especially of letting his wife and children remain there. The sanitary condition of the temporary home should be carefully examined in selecting it, and if *that* is not unexceptionable, no charms of scenery, or other attractions, however great, should be allowed to turn the scale in favor of the locality.

FOREIGN SCHOOLS FOR AMERICAN BOYS AND GIRLS.

In last month's Journal the mistake that is made in sending young men abroad to be educated was briefly considered. A foreign training is even more unsuitable for boys and girls, and yet many of our wealthy people send their children to European schools, or leave them there while travelling abroad. Since our former article was published, we have seen in the *Church Journal* a letter from Rev. W. C. Langdon, who is connected with a school at Geneva, Switzerland, in which he states what he considers to be the advantages and the disadvantages of educating American boys and girls in that city. After referring under the former head to some facilities for studying certain branches abroad, he frankly sets forth the other side as follows: —

"On the other hand, it is understood: That, however great the facilities for pursuing certain specific branches of study, such as those just named, the Geneva schools offer to American children *no* advantages for a solid *general* education and intellectual training over those which we have at home. Geneva teachers do not usually understand American children, nor is the system of instruction or the discipline of these schools adapted to their mental or moral wants or characters. The text-books are far inferior to our own, and no attention whatever is given to some branches upon which we lay much stress. It cannot, of course, be expected that English would be taught as at home, and the knowledge of French which is acquired is therefore very apt to be at the cost of that of the mother-tongue. While, therefore, there may be good reasons why parents already in Europe with their families should avail themselves of those advantages which Geneva does undoubtedly afford, to leave their children here during their own wanderings, and while special advantages in languages or music may well be sought here either for quite young children or by those who have finished or who wish temporarily to interrupt an academic course, yet I feel it my duty earnestly to deprecate the habit of sending American boys and girls away from home influences to be *educated* here, since there are, *for this object*, neither in Geneva, nor indeed, so far as I know, anywhere in Europe, any better schools than can be found at home."

THE STAIRS WE CLIMB.

A writer in the *Evening Transcript*, of this city, in whose signature we recognize the initials of one of our most promising young architects, calls attention as follows to one of the minor evils of our modern civilization: —

If the human race lived again, as they did once, in tents, huts, and caves, or even like the frontiersman on the Western prairie, the subject of stair-building would be of little moment. But it is a singular fact that the more civilized we get, the more we have to be plagued by stairs. When the frontiersman's family increases in numbers and years, one or more members are promoted to sleep close under the roof — an elevation which they attain by means of a ladder, which is the first type of stair. When you consider the help gained from the hands in ascending, the ladder is by no means the meanest or most inconvenient type of stair. As civilization ad-

vances onward and upward, the ladder gives way to the steep staircase; and from that we go on and up, until we are carried down the five pairs of stairs of a city block, to be taken, feet foremost, to our last resting-place, where we fondly hope whatever level we may attain may prove a dead level of perfect rest.

After enlarging upon the wretched way in which stair-building is usually done, he gives these very sensible practical hints as to the way it ought to be done: —

For the future and its new constructions, what we need is care in building. Put some thought into your stairs, and get some expert to do so before a board is sawed or a nail driven. The first point to be settled is location. Put your stairs where most convenient for the family for whose use they are intended, and do not start them directly from the front door, for the convenience of burglars or other visitors. Put them where they can be well lighted by day and night. Have an outside window to each flight if practicable. If you build a good staircase in a dark place you lose half the advantages of it. Stairs may well be located in a cold part of the house, leaving the warm and sunny corners for living-rooms. Make them broad of tread and easy of rise. No stairs meant for constant use should be steeper than seven and a half inches "rise" by ten and a half inches "going" (the "going" being the horizontal distance from riser to riser and not from riser to edge of nosing moulding). Put one or more landings if practicable; they make the way seem easier and furnish a good resting-place. A seat or bench on a landing is a good thing when attainable. See that the hand rail is of the right size to be grasped and the right height for the hand, and avoid sharp corners to newel posts that would hurt the hand. Don't sacrifice the main flight by squeezing in a mean back stair by the side of it. It is much better even to have one staircase arranged for the convenience of all. One of the most wasteful features of small-house building is this custom of crowding in a back stair. It is one of the relics of the dark ages, like the Yankee "shut-up best parlor," and the tomb-like "spare chamber," and like them should be abolished.

If a mansion is large enough, the main staircase with its hall may be made a noble feature and a fitting subject for graceful ornamentation; and this without cramping the second stairway for workaday use, which should be well removed from its more aristocratic neighbor. But, of vulgar things, one of the meanest is the attempt to ape in the cottage the style of the palace.

After all, certain general principles being stated, each single example has peculiar features of its own, and each stairway must be built as the great painter mixed his colors, "With brains, sir."

WENHAM'S REFLEX ILLUMINATOR.

Last September I received this ingenious illuminator from London, and examined several slides with its aid. The beautiful effect of a bright and clear illumination of the object, shown on a dark background, as described by the inventor and by Mr. Slack, was very interesting and instructive. I had then but few slides on which I could use it, and laid it aside for further investigation at a future time.

Mr. Wenham describes it in the *Monthly Microscopical Journal*, vol. vii. p. 236. It was designed for the illumination of such objects, mounted dry, as adhere to the surface of the slide, by rays of light of such obliquity that they cannot be transmitted beyond that point. The illuminator being connected with the slide by a film of water, the light passes through to the upper surface of the slide, and, if there is no object in contact with the slide at that point, is totally reflected; if, however, a diatom or other object rests on the slide at the point where the light strikes, the rays enter the object and are diffused by it so that it becomes in effect self-luminous.

This appears to be the only use for the illuminator described by the inventor. I have, however, lately used it for a different purpose, and with results quite surprising. While studying high-power objectives of large angular aperture, I experimented with various methods of illumination, and among others applied the reflex illuminator. I find that some immersion objectives are capable of transmitting the extremely oblique rays that pass through the illuminator, so as to give a bright field when used on balsam slides. In dry mounts the light cannot be transmitted beyond the upper surface of the slide, but in balsam-mounted slides the light passes to the upper surface of the cover and is there totally reflected. If an immersion objective is adjusted and connected with the cover by a film of water, the total reflection will be destroyed, and the light pass through the cover and water into the front of the objective. The ultimate direction of the ray of light after passing through the illuminator is not changed by the introduction of the different media (balsam, glass, and water), and the angle at which it enters the objective must therefore be greater than 41°. In examining Möller's *Probe Platte*, a balsam mount, under these conditions, with light from a kerosene hand-lamp, I easily resolved the *Amphipleura pellucida*; so clear and decided were the lines that with a power of 8000 they were still visible. I first obtained this unexpected result with my Powell and Lealand $\frac{1}{16}$, and the light was sufficiently bright to render it possible to use a $\frac{1}{2}$ inch eye piece and concave amplifier. As the $\frac{1}{16}$ has the power of a $\frac{1}{20}$, I obtained, by estimation, a power of 8000 diameters.

The resolution of this difficult diatom, as well as the *Frustulia Saxonica* and *Nitzschia curvula* (Nos. 18 and 19 on the *Probe Platte*), far surpasses any that I have ever seen by artificial light, and rivals the beautiful resolution obtained by monochromatic sunlight. With this illuminator it is much easier to resolve the *Amphipleura* in balsam than to resolve it dry with any other artificial illumination.

I find, however, as yet but few objectives capable of transmitting light of such extreme obliquity through the back systems. The Powell and Lealand $\frac{1}{16}$, as I have above stated, succeeds admirably. My Tolles $\frac{1}{18}$ immersion gave only a dark field.

Of several others I have succeeded with only three: a $\frac{1}{16}$ made several years ago, a four system $\frac{1}{6}$, and a four system $\frac{1}{16}$, the last two of recent construction and all three made by Tolles, and all of course immersion. I have not had access to Continental objectives of wide angle. The three objectives of Tolles last named resolve the whole of the frustule of the *Amphipleura* at once, while the Powell and Lealand $\frac{1}{16}$ resolves only a part at one view, even when the whole frustule is in the field. The advantages of the reflex illuminator in thus furnishing light of greater obliquity than has been obtained by other methods seem to me worth considering by these interested in testing the resolving power of objectives.

I find it advantageous to connect the illuminator with the slide by glycerine, instead of water, as it does not evaporate. The higher refractive power of glycerine makes no difference in the ultimate direction of the light.

With high amplification the lines of the *Amphipleura* become decidedly beaded, but do not separate into dots.

Samuel Wells.

Boston, *May* 10, 1875.

EDITORIAL NOTES.

The Belgian Exhibition of 1876. — Of international exhibitions of a general character and on a grand scale, the one at Vienna will probably prove to have been the last in Europe, at least for many years to come. But special exhibitions, like the one devoted to maritime industries, to be held this year in Paris, will doubtless become more and more frequent. There is to be one in Belgium next year quite novel in scope and object, comprehending all appliances and apparatus calculated in any way to save life or health. This is a broad and worthy field of study, and one which will most certainly enlist the sympathy and hearty coöperation of all nations. It is a duty that all civilized countries owe to one another, that all inventions or discoveries whereby disease or danger may be averted should be made generally known as soon as possible, and that such inventions should receive fitting rewards to still further stimulate research in such directions. This worthy object of exhibition has been suggested and advocated principally by the *Société Royale des Sauveteurs de Belgique*, whose labors are worthy of much praise, and who seek by the publication of their conferences and debates to inform their fellow-countrymen of all that may be done by scientific research and precaution against the ills that flesh is heir to. All the experiments upon the river or the sea will take place at Antwerp and Ostend, and the factory-owners of the country will coöperate gladly in assisting such experiments as can be made only in workshops or factories.

The following is a summary of the different heads under which exhibition is asked: (1) Preservation of life in case of fire; (2) all apparatus, engines, etc., for the preservation of life, in or on water, or for the prevention of danger to the same; (3) apparatus for the prevention of accidents in crowded thoroughfares, tramways, and railways; (4) assistance in time of war; (5) medical and sanitary arrangements for the preservation of public health; (6) means for prevention and safety applied to industry; (7) domestic and private medical arrangements; (8) medicine and surgery; (9) institutions for improving the social condition of the working classes; (10) health in connection with agriculture.

Telegraph Operator's Paralysis. — Civilization is ever developing new diseases, of which the "writer's cramp," to which we have several times referred, is an apt illustration. Another, and a new one, is a particular form of paralysis to which telegraph operators are liable, and of which some cases are reported in foreign journals just received. The disease is thus described in a report made by a French physician to the *Académie des Sciences*: "An employé who had been engaged for nine years in a telegraph office found that he could not form clearly the letters U, represented by two dots and a stroke; I, represented by two dots; and S, by three dots. On trying to trace the letters his hand became stiff and cramped. He then endeavored to use his thumb alone, and this succeeded for two years, when his thumb was similarly attacked, and subsequently he tried the first and second fingers, but in two months these were also paralyzed." Finally he had recourse to the wrist, which also shortly became disabled. If he forced himself to use his hand, his whole arm and the side of his body trembled violently, and cerebral excitement ensued. This disorder is reported to be common among telegraph clerks abroad, and arises from the constant straining of the same muscles in a never-varying occupation. In this respect, its resemblance to "writer's cramp" is obvious.

Tourist Arrangements for British Visitors to the Centennial Exhibition. — We see by foreign papers that Messrs. Cook and Son, the famous tourist agents of London, have been appointed general passenger agents to the British section of the International Exhibition at Philadelphia in 1876. Their duty will be to make, on behalf of the British executive, the whole of the arrangements with the Atlantic steamers and railway companies for the conveyance of the exhibitors, their assistants and work people, and also for the conveyance of the

goods to be exhibited; and exhibitors may rest assured that every effort will be made to obtain as liberal arrangements for crossing the Atlantic as were made for the English exhibitors at the Vienna Exhibition of 1873. The business could not be in better hands, and the appointment will undoubtedly be the means of largely increasing the number of English visitors to Philadelphia next year.

AQUARIA IN ENGLAND. — Just now the establishment of great aquaria is the "rage" in England. This is owing not altogether to the scientific interest in the subject, but quite as much, probably, to the fact that the aquaria at Sydenham and Brighton are paying from ten to twenty-five per cent. annually to the stockholders. A very fine aquarium has just been opened at Southport, the popular sea-side resort near Liverpool, and others are planned for Plymouth and Scarborough. Work has already begun on the magnificent aquarium and winter garden on the Thames Embankment in London. In Edinburgh they are talking of a similar establishment on a grand scale, and Birmingham is also agitating the subject. *Nature* predicts that every large town in the kingdom will soon be in possession of an aquarium. When will our American cities follow suit?

ATOMS.

A TELEGRAM from Vienna, dated April 14, says that a contract for the purchase of 10,000 horses, to be delivered at the end of June, has been concluded on behalf of France, at the horse fair of Netolitz, in Bohemia. — The Mexican government offers a prize of $20,000 to the first quicksilver mine in the country that shall produce 500 flasks of that metal; and a metallurgist who is well acquainted with the resources of Mexico affirms that there are fifty localities where the thing can be done, if proper steps are taken. — *Old and New* has been merged in *Scribner's Monthly*, with which Rev. E. E. Hale will hereafter have a special connection. — California, which wants to do everything that can be done, now proposes to go into the manufacture of condensed milk, large quantities of which are said to be demanded by the Japan and China markets. — *Home and School* is getting to be a well illustrated magazine, in addition to its other merits, and teachers who send to J. P. Morton & Co., Louisville, Ky., for a specimen number are likely to be tempted into becoming permanent subscribers. — A ready way of imitating ground glass is by dissolving Epsom salts in ale (don't use this as a beverage), and applying with a brush; as it dries it crystallizes. — "How Varnish is Made" is the title of a very handsome illustrated pamphlet issued by Valentine & Co., the well-known New York house in that line of manufacture. — Tea is now consolidated into cakes by powerful hydraulic presses, in which form it is said to retain its flavor better, and consequently to be more economical, than in the ordinary loose condition. — The *New York State Educational Journal* has been swallowed by the *School Bulletin*, but its place on the list of school periodicals is filled by the *Brooklyn Journal of Education*, published by John L. Culyer, the first numbers of which look well. — The *New England Journal of Education*, which was promising at the start, has improved with every number, and is fast gaining favor with the teachers, who, by the bye, will find it on our "Clubbing List." — Mr. H. M. Raynor, of New York, is agent for the London firm of platinum-workers referred to in the article on our first page. — These "Centennial" times awaken an interest in our early annals, and Abbott's little "Paragraph History," which is brief enough to suit the busiest man, while it admirably epitomizes the entire national record, is much in demand, having already reached a third edition. — A third "vacation tour" to Europe is announced by Cook, Son, and Jenkins; the party to sail from New York on the 3d of July, and to be gone 50, 64, or 78 days, at option, all expenses to be covered by 325, 450, or 550 dollars, gold. — *Harper's Magazine* is publishing a valuable series of illustrated articles on "The Stone Age in Europe." — The new Alexandra Palace has just been opened in London, and the descriptions in the English papers show that it will be a formidable rival to the well-known establishment on the opposite side of the city, at Sydenham. — Another new planetoid, the 144th, has just been discovered by Perrotin in France. — It is said that a man who was ordered by the family doctor to take two blue pills "in some convenient vehicle" sat down in his wheelbarrow to swallow them, as he did n't keep a carriage! — The Italian government will distribute this year 5000 plants of the *Eucalyptus globulus*, for cultivation in malarious districts. — Within a few months American medical journals have reported three cases of chloroform narcosis in which Nélaton's method of resuscitation was successfully employed. — In the paragraph on "Rubber Thermometers," on page 111 (April number), the statement in the closing sentence should of course be that the mercury will fall with rise of temperature, and *vice versa*. — "Questions and Answers" are unavoidably laid over to our next number.

LITERARY NOTES.

THE Harpers have published the *Annual Record of Science and Industry* for 1874, edited by Prof. Spencer F. Baird, uniform in style with the volumes for the three preceding years. From the first this year-book has been a great advance upon all former compilations of the kind, and this issue is even better than its predecessors. It is larger, containing 873 pages, and has, in addition to its former departments, a list of the more important works on science and its applications that have appeared during the year, with name of publisher, price, etc. The introductory "Summary of Progress," filling 186 pages, is remarkably well done, and all the matter in the book is carefully condensed from the original sources, to which reference is made in all cases. Besides the classified Table of Contents there is an alphabetical Index of 27 pages. The price of the book is only $2 00, and the four volumes are offered, postpaid, for $7.00.

Of recent books of travel published by the Harpers none is more noteworthy than *Thomson's Malacca, Indo-China, and China*. It gives us, not the impressions of a transient visitor to those lands, but the careful record of a ten-years' resident, who has been diligent in gathering his materials and skilful in arranging them for publication. The sixty or more illustrations are from his own photographs and sketches, and are uncommonly good. As the *Athenæum* remarks, "They supply the untravelled public with a better notion of Eastern life and scenery than can be obtained within the same limits from any other source."

Mohammed and Mohammedanism, by R. Bosworth Smith, A. M. (Harpers), is a course of lectures delivered at the Royal Institution last year, which at once "made their mark" as the most faithful and discriminating view of the subject that has ever been published. The *Westminster Review* commends the work as "clear, accurate, and in the best sense popular," and as "an important contribution to our historical theology;" a verdict indorsed by all the leading English critics.

In the "International Scientific Series," two new books have appeared: Prof. H. Vogel's *Chemistry of Light and Photography* and Prof. W. D. Whitney's *Life and Growth of Language*. The former would be faultless as a popular exposition of the subject, were it not unfortunately marred by many typographical errors (for instance, "iodide" and "bromide" repeatedly for iodine and bromine) and other little slips pardonable in a foreigner writing English, even though he writes it as well as Professor Vogel usually does. The proofs should have been read by the editor of the series, or some other person familiar both with the subject and with its English technicalities. These little blemishes ought to be removed in a second edition.

Professor Whitney's book is to be commended without any qualification, as those who have read his earlier works on linguistic science do not need to be assured. Indeed, this is essentially a more concise and more popular presentation of the same material, — "the old story told in a new way," to use his own words, — the chief omissions being of controversial matters.

To the "Popular Science Library" has been added Galton's *English Men of Science: their Nature and Nurture*, a work which has attracted much attention and elicited much discussion abroad, but which has hitherto been accessible to American readers only in the costly English edition. It is virtually a "natural history of the English men of science of the present day," the subject of hereditary influences being specially considered.

Boys and Girls in Biology, by Sarah H. Stevenson (Appletons), contains simple studies of the lower forms of life, based on the latest lectures of Professor Huxley (and published under his sanction), with copious illustrations. It will prove an attractive book for the young, either for home reading or for elementary instruction in school.

Hurd and Houghton have now ready the *third* edition of Judge Holmes's *Authorship of Shakespeare*, with an Appendix of nearly a hundred pages now first printed. The book is the ablest and most complete presentation of the theory that Bacon was the author of the plays, and contains so much that is curious and interesting with regard to both Bacon and Shakespeare that it is indispensable to every student of either, whatever may be his opinion of the question in dispute. The chapter on the "parallelisms" in the diction of the two authors (for we must reckon them as twain, in spite of the judge's ingenious plea that they be "made one") is of itself worth much more than the cost of the book to the Shakespearian scholar or critic. In the new Appendix, a letter from Mr. Spedding to the author is printed, in which the arguments against Bacon are succinctly and forcibly put; and there is other new matter of much interest, especially that pertaining to the recently discovered "Northumberland MS.," which certainly helps the judge's case, though it is not conclusive in its favor. Those who have read the book will want this new matter; and those who have not read it should do it now, if only as a chapter in the history of English literature that no cultivated person can afford to be ignorant of.

Our Sketching-Club, by Rev. R. St. John Tyrwhitt (Roberts Bros.), is a series of letters and studies on landscape art, connected by a slight thread of fiction. The lessons and wood-cuts in Ruskin's "Elements of Drawing" have been worked into the book in a more popular form than that in which they first appeared, and under the sanction of their author. The result is a manual of practical art, which will be found valuable to the student of adult years and of average culture in other matters, as a guide in drawing, while it will afford him some amusement by the way. The typography and illustrations are excellent.

Mrs. Tytler has followed her books on the painters with *Musical Composers and their Works*, which has also been reprinted by Roberts Bros. It is designed for the use of young people in the course of their musical education, and is equally adapted to the wants of the general reader. It gives sketches of the lives and works of more than fifty of the great composers of Europe.

English Lessons for English People, by Rev. E. A. Abbott and J. R. Seeley, M. A. (Roberts Bros.), is not a school grammar, but a good book to follow the grammar as a manual of derivation, diction, metre, and composition. It is also well suited to the needs of the private student. We suspect that it is not so well known to teachers as it ought to be. They will find it vastly superior to most of the current text-books covering the same ground.

Another boys' book that, like "Harry Blount," is of quite exceptional merit, is Robert Lowell's *Antony Brade* (Roberts Bros.). It would be hard to find a third worthy of the same unqualified commendation among the hundreds of recent works of fiction for young folks.

Sex in Industry, by Azel Ames, Jr., M. D., special commissioner of the Massachusetts Bureau of Labor (Osgood & Co.), gives the results of thorough and extended investigations into the effects of industrial occupations upon women. It is a companion volume to "Sex in Education," and deals with questions hardly less important, though probably it will not provoke so much controversy as that famous book did.

Transatlantic Sketches, by Henry James, Jr. (Osgood & Co.), has the refinement and artistic beauty that mark everything he writes. It abounds, too, in exquisite bits of pictorial description which give it a peculiar charm for one who has been over the same ground; or it will make a delightful and suggestive part of the preparatory reading for a tour abroad.

Social Science and National Economy, by Robert E. Thompson, professor in the University of Pennsylvania, has just been published by Porter and Coates, of Philadelphia. We think the author has been successful in his effort to furnish a compact treatise for those who wish to get some knowledge of the subject, but have neither the time nor the inclination to study elaborate or voluminous works; and also to provide a text-book for advanced schools and colleges. He belongs to what is sometimes called "the Philadelphia school" of political economists, and of course his book will find no favor with the rival school.

What Young People Should Know, by Prof. Burt G. Wilder (Estes and Lauriat), treats of "the reproductive function in man and the lower animals," and, as the title implies, is intended for young people. It is well-meant, and in some respects well done, but is far too technical in style for unscientific readers, whether young or old. It is singular that a writer who has written so many good things in the way of "popular science" should have failed so completely in this instance. We have our doubts whether the best book of the kind may not do more harm than good, though there is force in what Dr. Wilder says on the other side. His book is the least objectionable of its class that we know of.

A History of the Battle of Bunker's Hill, by George E. Ellis, is an admirable historical monograph, and timely withal. It is published in a neat illustrated pamphlet by Lockwood, Brooks, & Co. (who, by the bye, have all the above books for sale), and costs only 35 cents.

The *Pharmacal Gazette*, of Nashville, Tenn., has been added to our "Clubbing List." It is the only pharmaceutical weekly published in the country, and is as good as it is cheap, especially when thus taken *with the* JOURNAL.

The *Young People's Magazine*, published by W. Guild & Co., 11 Bromfield Street, Boston, entered upon its second volume with the March number. It gives every month 48 pages of good reading, with plenty of pictures, at the very low price of $1.50 a year.

Medicine and Pharmacy.

JABORANDI.

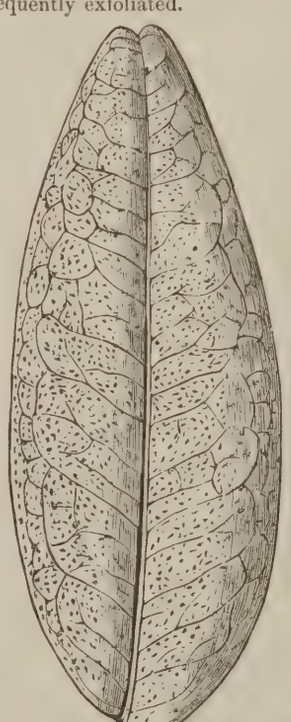
We have already made brief reference to this new plant, which is attracting extraordinary attention abroad. The foreign medical journals are all discussing it, and its virtues are being tested in hospital and other practice. The London *Chemist and Druggist* says of it: —

"This Brazilian plant with the savage name is evidently the drug of the day. It arrived in Europe a year ago like Elijah's cloud, no bigger than a man's hand; now all our wholesale houses are sending to Pernambuco for cargoes of it, and two or three of the smartest of them have already secured small stocks. Besides perspiration, there is money to be made out of it, and more than this, there is glory also; so pharmaceutical, medicinal, and chemical investigators are turning their attention to jaborandi. . . . Dr. Ringer and some of his associates at University College Hospital have been experimenting with the medicine therapeutically. . . . To adults they have administered doses of from sixty to ninety grains in the form of infusion, and in nearly all cases profuse perspiration and most enormous salivation ensued very rapidly. The saliva collected from the patients averaged about an imperial pint, and in one instance amounted to twenty-seven fluid ounces. . . . Evidently the medicine is possessed of very important properties, and it now becomes a question of considerable interest to ascertain the precise principle of the plant to which these effects are due. . . . Several chemists are working at the subject, and this doubt will therefore probably be soon cleared up."

From the *Tennessee Pharmacal Gazette* we condense the following description of the plant: —

"It is a shrub about five feet high. The root is cylindrical, hardly tapering at all, nearly three quarters of an inch in diameter for the first twelve inches, and very sparingly branched. The bark of the root is of a pale yellowish-brown color, and has a very short fracture. The outermost layers are very thin and papery, and are frequently exfoliated.

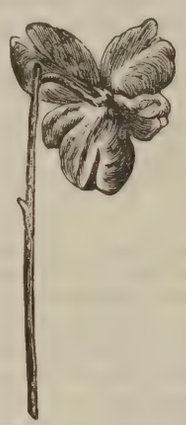
"The stem is half an inch in diameter near the root, narrowing to a quarter of an inch in the upper branches. The bark is thin, of a grayish-brown color, and readily scales off when the stem is broken or bent. The wood of the stem is yellowish-white, and is remarkably fibrous. The stem is alternately branched at a very acute angle (of about 20°), the branches being erect and furnished with alternate leaves. The leaves, one of which is represented, are imparipinnate, and about nine inches long, with but three to five pairs of opposite leaflets, which are articulated to the rachis and have very short, slightly swollen petiolules. The rachis of the leaf is swollen at the base.



Leaflet, considerably reduced to show outline.

"The leaflets are very variable in size, even on the same leaf. Their general outline is oblong-lanceolate. They are entire (see cut), with an emarginate or even retuse apex, and an unequal base. The veins are prominent on both sides of the leaf, and branch from the midrib at an obtuse angle (about 60°) in a pinnate manner, remaining distinct until within one quarter of an inch of the margin of the leaf, where they become lost in the network of veinlets. The midrib is scarcely prominent on the upper, but forms a distinct keel on the under surface of the leaflet. When held up to the light the leaflets are seen to be densely pellucidly punctate. These pellucid dots, which are receptacles of secretion, are not arranged, as in another kind of jaborandi, in lines along the veinlets, but are irregularly scattered all over the leaf, and appear equally numerous in every part; they are mostly rather large, but vary a little in size. The whole plant is glabrous."

Leaf, under size, showing venation.



Fruit and peduncle, natural size.

Experiments with the new drug suggest a curious relation, partly of analogy but mainly of opposition, between jaborandi and belladonna. It resembles atropia in quickening the pulse, flushing the face, and exerting a more decided influence on adults than on children. On the other hand, it is diametrically opposed to atropia in its action on the salivary, sudoral, and mammary secretions, on the pupil, and on the minute arteries. Further, the tendency of belladonna to cause delirium contrasts with that of jaborandi to cause prostration and sleepiness. It has been proved that atropia is able to arrest the flow of saliva caused by jaborandi; and Ringer found that a dose of the latter drug speedily removed the dryness of the mouth in a case of accidental poisoning by atropia. Sweating after jaborandi may be prevented or checked by the subcutaneous injection of one hundredth of a grain of atropia.

Merely as a sialagogue the drug can have but a limited application, for the practical uses of sialagogues are few, but as a sudorific it is likely to prove of great value. It may also turn out to be a trustworthy antidote in poisoning by belladonna; and other virtues, unsuspected as yet, may be found to exist in the plant when it becomes better known.

ALCOHOL: ITS ACTION AND ITS USES.

II.

The theme of Dr. Richardson's third lecture was the primary physiological action of ethylic or common alcohol on animal life. He said that this subject might be discussed in two ways: (1) as to the mere physical action of alcohol on the body, and (2) as to its action as a food. Many substances, such as chloroform or opium, produce very marked results when taken into the system, but do not in any way act as foods or sustain the vital powers; other substances act as foods. Alcohol is peculiar in that we must consider it from both of these points of view. The purely physical action of alcohol was first considered.

Alcohol may be introduced into the body by many channels, but it passes into the blood in every case. The shortest way is by inhalation; the longest and ordinary way is by the stomach. When taken into the stomach, however, alcohol cannot be absorbed into the system until it has undergone a certain degree of dilution with water. When we dilute alcohol with water before drinking it, we quicken its absorption. If we do not dilute it sufficiently, it is diluted in the stomach by transudation of water until capable of absorption by the veins.

Alcohol, in its passage through the body, first reaches the blood, and coming in contact with all parts of the blood, it produces disturbing action if present in sufficient quantity. It may cause the corpuscles to run too closely together, and to adhere in rolls; it may modify their outline, making the clearly-defined, smooth outer edge irregular or crenate, or even star-like; it may change the round corpuscle into the oval form; or in very extreme cases it may produce a truncated form of corpuscle, in which the change is so great that if we did not trace it through all its phases we should be puzzled to know whether the object were indeed a blood-cell. These changes are due to the action of the spirit on the water contained in the corpuscles. The spirit absorbs this water from the corpuscles. While these changes are going on, the power to absorb and fix gases is impaired, and when the aggregation of the cells in masses is great, other difficulties arise, for the cells united together pass less easily than they should through the minute vessels, and thus impede the current. Alcohol in excess acts also on the fibrine of the blood. It may act in two ways, according to the degree in which it affects the water that holds the fibrine in solution. It may fix the water with the fibrine, and thus destroy the power of coagulation; or it may extract the water so as to produce coagulation. This explains why in acute cases of poisoning by alcohol the blood is sometimes found quite fluid, at other times firmly coagulated in the vessels.

Alcohol paralyzes the minute vessels, and allows them to become dilated with blood. But the action of the alcohol does not stop there. With the disturbance of power in the extreme vessels disturbance is set up in other organs, and the first organ that shares in it is the heart. The vessels being relaxed, and resistance removed, the heart begins to run quicker, with a weakened recoil stroke. It is easy to account in this manner for the quickened heart and pulse which accompany the first stage of deranged action from alcohol, and it is interesting to know to what extent this increase of vascular action proceeds. The information on this point is exceedingly curious and important.

Dr. Richardson then referred to his own experiments on pigeons, and gave an account of the researches of Professor Parkes and the late Count Wollowicz. They found that the average number of beats of the heart in 24 hours during first or water period, when no spirit was imbibed, was 106,000; in the alcoholic period, 127,000; in the brandy period, 131,000. These

were the eventual average results obtained from eight observations, operating upon the young and healthy adult man.

The highest of the daily means of the pulse during the eight days of the water period was 77.5 beats; the next highest was 77. Comparing the mean of this one day, namely, 77 beats per minute, with the alcohol days, we find:—

	Times more.
On the 9th day, with one fluid ounce of alcohol, the heart beat	430
On the 10th day, with two fluid ounces .	1872
On the 11th day, with four fluid ounces .	12,960
Lastly, on the 14th day, with eight fluid ounces	25,488

The first day of alcohol gave an excess of 4 per cent., and the last of 23 per cent.; the heart, therefore, during the concluding alcohol stages was doing one fifth more work. The heart, however primarily excited, soon begins to flag, and more stimulus is necessary to carry on the work; other organs than the heart are also implicated.

The flush seen on the cheek during the first stage of alcoholic excitation is commonly presumed to extend merely to the parts exposed to view. It cannot, however, be too forcibly impressed that the condition is universal in the body. If the lungs could be seen, they too would be found with their vessels injected; if the brain and spinal cord could be laid open to view, they would be discovered in the same condition, and so on. Dr. Richardson said he had witnessed this vascular condition of the lungs of an animal killed suddenly when under the influence of alcohol. He once had the opportunity of observing the same phenomenon in the brain structure of a man who, in a paroxysm of alcoholic frenzy, had his brains dashed out by the wheel of a railway carriage. The brain, entire, was examined three minutes after death. It exhaled the odor of spirit; its membranes and minute structure were vascular in the extreme. "It looked as if it had been injected with vermilion." The white matter of the cerebrum could scarcely be distinguished, and the pia mater, the internal vascular membrane covering the brain, resembled a delicate web of coagulated red blood.

The function of the spinal cord is influenced by the continued use of alcohol. This is the seat of automatic mechanical acts, and these pure automatic acts cease, under the influence of alcohol, to be carried on, the nervous control of certain of the muscles is lost, and the nervous stimulus is enfeebled. Then come in swift succession the impaired condition of the brain centres, and the will and judgment suffer shipwreck; the rational part of man abdicates, the emotional or organic reigns. Happy is it for the inebriate that the brain fails before the heart, which to the last remains faithful to i s duty. When once the circulation dies, the tragedy is finished.

SLEEP AND HOW TO SECURE IT.

Mr. Frank Buckland, in a recent article on this subject in *Land and Water*, takes the ground that it is natural for man, like other animals, to sleep soon after eating. The following passage will be indorsed by all who are in the habit of after-dinner naps or late suppers:—

The human frame cannot do without sleep. I believe the reason is that the mysterious property — for want of a better name we call it "vital energy" — gradually leaks out during the day. During sleep, the machinery of the body, especially the brain, becomes recharged with it. The cause of not being able to sleep — I write now of people in good health, and hard workers with their brains — is that the brain cannot, so to speak, "go down," but it continues to act, more or less. My father, when writing the Bridgewater Treatise, had his own way of working. He was an excessively busy man during the day, and had only the night hours in which he could write. He generally dined at seven o'clock, and immediately after dinner went to sleep for two or three hours. He then got up, and worked on till two or three in the morning. Just before retiring to rest, he took some light pudding, or a sandwich, with cocoa or milk. Thus he always slept well, as the blood was diverted from the brain to the stomach.

I have no hesitation in saying that the proper thing to do is to go to sleep immediately (or at least very soon) after the meal of the day. All animals always go to sleep, if they are not disturbed, after eating. This is especially noticeable in dogs; and the great John Hunter showed by an experiment that digestion went on during sleep more than when the animal was awake and going about. This is his experiment: He took two dogs and gave them both the same quantity of food. One of them was then allowed to go to sleep, the other was taken out hunting. At the end of three or four hours he killed both these dogs. The food in the stomach of the dog which had been asleep was quite digested; in that of the one which had been hunting, the food was not digested at all.

The following is interesting as an anecdote of an eminent man, and worth noting also for its own sake:—

I well recollect the late Dr. Wilberforce, then Bishop of Oxford, telling my father, then most actively engaged as Dean of Westminster, of his patent way of going to sleep. It is better than the old-fashioned prescription of watching sheep jumping through a hedge one after another, ships sailing out to sea, etc. The bishop's prescription was to *repeat very slowly the vowels A E I O. In doing this they were to be faintly pronounced with each inspiration and expiration.* It will be found easy to do this without moving the lips, but the vowel U must not be pronounced, for to do this the muscular action of the lips necessarily takes place, and sleep comes not. I advise my readers to try this plan.

Farther on the writer gives a prescription for want of sleep which he has himself tested:—

I now venture to suggest a new but simple remedy for want of sleep. Opiates in any form, even the *Liquor opii sedat.* and chlorodyne, will leave traces of their influence the next morning. I therefore prescribe for myself, and have frequently done so for others — onions; simply common onions raw, but Spanish onions stewed will do. Everybody knows the taste of onions; this is due to a peculiar essential oil contained in this most valuable and healthy root. This oil has, I am sure, highly soporific powers. In my own case they never fail. If I am much pressed with work, and feel I shall not sleep, I eat two or three small onions, and the effect is magical. Onions are also excellent things to eat when much exposed to intense cold. Mr. Parnaby, Troutdale Fishery, Keswick, informs me that when collecting salmon and trout eggs in the winter, he finds that common raw onions enable him and his men to bear the ice and cold of the semi-frozen water much better than spirits, beer, etc. The Arctic Expedition, just now about to start, should therefore take a good stock of onions. Finally, if a person cannot sleep, it is because the blood is in his brain, not in his stomach; the remedy, therefore, is obvious: call the blood down from the brain to the stomach. This is to be done by eating a biscuit, a hard-boiled egg, a bit of bread and cheese, or something. Follow this up with a glass of wine or milk, or even water, and you will fall asleep.

MILK DIET IN TYPHOID FEVER.

Dr. L. R. Rogers, of Albany, sends to the *Medical Record* the following account of his management of a severe case of typhoid fever on the milk-diet principle:—

"The point to which I wish to call attention is the diet part of the treatment. As soon as I felt sure that she was to have a regular 'run' of fever, I commenced to give milk — fresh, raw, cow's milk, from one cow, and not more than twelve hours' old at any time. I gave, during the height of the disease, from one and one half to two quarts per day; every hour at first, then every half-hour, and for over two weeks every quarter-hour, without any water or other food, except a few times when I tried beef-tea and other dietary preparations. The latter in every instance raised her pulse and fever, and thickened the fur on tongue. Her bowels gave no trouble, moving by injections once in four or five days, the dejections like those of an infant. Quinine and stimulants made her worse every time when tried, and the severe pain in back and limbs, which came on every day about six P. M., was quieted in ten or fifteen minutes by a mild current of Faradic electricity from the back of the neck to the sacrum or feet, which was continued twenty or thirty minutes.

"This treatment I used for thirty-two consecutive days, giving each time a good night's rest, free from pain, without anything in the shape of opiates. I had the best counsel the county afforded, and the case was considered by all who saw it one of the most severe.

"Small doses of the sulphite of soda were all the medicine she took that did not disagree, and I gave this simply to prevent decomposition in the milk.

"There were many fatal cases in the epidemic, but all who bore milk well recovered. In this case, although she had the nourishment in one and one half to two quarts of the best milk, she continued to get weaker and weaker for over four weeks, which shows very plainly that any other diet would have failed to meet the emergency.

"Milk contains all that is needed to nourish and keep up every part of the system, nearly, and is always the same; while our best dietary mixtures are wanting in many things needed by the economy, and cannot be made twice alike. I have since that time used milk very freely in all stages of various diseases, and have had reason to be well satisfied with it as the best diet, for both adults and children.

"I do not put forth this case as one to copy from in the particular treatment, but simply to show that the best article of diet that the world contains, either in disease or in convalescence, and one always obtainable, is too often neglected, and complex dietary compounds used instead. The patient in this instance was confined to the house over eight weeks, and made an excellent recovery. She was thirty-six when it occurred, and is now forty-three, and has never been sick since."

PHARMACEUTICAL RED TAPE IN PARIS.

The London *Chemist and Druggist* translates a little sketch by Charles Monselet, entitled "Chez un Pharmacien," which has so many good hits at the French way of doing things that we cannot refrain from transferring the greater part of it to our columns. We know from experience how long it takes to get a prescription put up in a Parisian apothecary's shop. Indeed, we are quite certain that we could identify the very "Pharmacy G——," which is thus described:—

The Pharmacy G—— is one of the handsomest in Paris. In the first place, it is situated in a central quarter, that is to say, in proximity to the greater part of the accidents. The shop is large and airy, its windows are adorned with curiously shaped bottles filled with variously colored spirits; the interior is decorated with undoubted good taste; there are urns wherein serpents are coiled, dark green busts of Esculapius and Galen, and copper sphinxes support the counters. . . .

I can never explain it to myself, but pharmacies have always a fascination for me, possessing, as they do, a methodical aspect and an exceptional atmosphere. From the powders, minerals, roots, plants, herbs, dried flowers, the unguents, pâtés, elixirs, there exhales an odor singularly pleasing to me, and amidst which I fancy I should like to live.

All at once, while I was examining all those jars, so alike in appearance and so diverse in contents, a woman pushed open the door of the shop violently, and entered. She had hardly strength enough left to speak; her countenance was convulsed; she could only hand to the *pharmacien* a prescription which she held clutched in her trembling fingers.

Her husband has just received a féarful wound in the head; he is now lying on his bed unconscious. The doctor, called in haste, has written rapidly a few lines upon the paper she has brought. It is these few lines that she has passed to the *pharmacien*, who is calmly and gravely unfolding them, for a *pharmacien* should never cease to be grave. He is slowly deciphering the writing, for a *pharmacien* should, before all, make himself well acquainted with the details of a prescription. When he has finished reading it, he says to the woman, —

"Be good enough to take a seat. Sit down! sit down!"

"But, sir," she cries, "do you not understand that my husband is in the greatest danger? Give me quickly what is required!"

"It will only take an instant; please to sit down."

The poor woman sinks into a chair, her arms hanging listlessly on each side, and her face expressionless from anxiety and fatigue.

During this time the *pharmacien* sets to work. He takes a small vial, places it in the beautiful scales before him. He goes to a row of the jars arranged like books in a library. He pours from one a few drops into the small vial. He then weighs it, and adds more from another jar. All this with the care and system recommended by the "Codex."

From time to time the woman jumps from her seat suddenly. Her husband, pale and covered with blood, haunts her, and she turns to the *pharmacien* and joining her hands in supplication, she says, —

"Oh! sir! sir!"

"Patience" —

"My poor husband!"

"It will soon be ready, madame."

Saying this, the *pharmacien* corks hermetically the little vial, which is at last full; he takes from a drawer a piece of green paper, with which he covers the cork, arranging its folds with a tedious neatness and regularity; he ties it with a bit of red twine, and trims the paper with a pair of scissors; then he plunges a stick of sealing-wax in the gas jet, and deposits upon the summit a lighted drop, in which he affixes the ends of the twine.

"Oh! sir! sir!"

Our *pharmacien* has not yet finished; he has now to find a label and paste it upon the bottle, then to write in a plain hand the number of the prescription, the name of the mixture, and whether for internal or external use, not forgetting the hackneyed phrase, "shake before using."

"Sir! sir!"

"It is finished, madame."

In point of fact, after having accomplished all these indispensable formalities, the *pharmacien* rolls up the vial in an elegant quality of paper, and presents it to the woman.

"How much? how much?" stammers she, feeling for the money in the pocket of her dress.

"Pay at the desk."

At the desk sits enthroned the proprietor of the pharmacy, with a majestic air, dreamily perusing the latest *livraison* of pharmaceutical literature; he detains the poor woman several minutes more, and at last she receives her change; then she precipitates herself towards the door, when she encounters again the clerk, who politely opens it for her, in the midst of a deafening rattling of the bell attached thereto. . . .

Such is the scene, dear neighbor, which I accidentally witnessed the other day. May Heaven preserve you from ever going to procure anything else in the Pharmacy G—— than an agreeable sirup or some perfumed pastilles.

PHYSIOLOGICAL NOTES.

Copper in the Human Body. — A recent French trial of a case in which a man had poisoned his wife with a salt of copper has given fresh interest to the question whether copper is normally present in the organism. MM. Bergeron and L'Hôte, the experts on whose evidence the verdict was based, have investigated the point with great care and report the results in the *Comptes Rendus*. The fact that copper, when introduced into the system through the alimentary canal, accumulates in the liver and kidneys — a fact known to Orfila — served as a starting-point for their inquiry. These organs were analyzed in fourteen cases, whose history made it practically certain that no copper compounds had been swallowed for a considerable period before death. They were invariably found to contain traces of the metal, varying in amount from a quantity incapable of being numerically estimated (in a young man of seventeen) to one of two milligrammes (in the body of a man aged seventy-eight). The conclusion is, that when the total mass of the liver and kidneys contains more than three milligrammes of the metal, it must have been introduced into the system in unusual quantity. The traces normally present are attributed by the authors to such accidental causes as the use of copper utensils for cooking, etc.

The Prevailing Hour of Death. — Dr. Lawson has recently published some curious observations regarding the time of the day when the greatest and least number of deaths occur. He finds, from the study of the statistics of several hospitals, asylums, and other institutions, that deaths from chronic diseases are most frequent between the hours of eight and ten in the morning, and fewest between like hours in the evening. Acute deaths from continued fevers and pneumonia take place in the greatest ratio in the early morning, when the powers of life are at their lowest, or in the afternoon, when acute disease is most active. The occurrence of these definite daily variations in the hourly death-rate is shown, in the case of chronic diseases, to be dependent on recurring variations in the energies of organic life; and in the case of acute diseases, the cause is ascribed to the existence of either a well-marked daily extreme of bodily depression, or a daily maximum of intensity of acute disease.

The Effect of Emotion. — It is related by Sprengel in his "Geschichte der Arzneikunde," that the Arabian physicians sometimes relied with great success on moral means, of which the following is a striking instance. One of Haroun Al-Raschid's wives suffered from paralysis of both arms. Dschibrail, the court physician, induced the caliph to summon all the leading nobles to a large hall in his palace, and then introduced the lady to the assembled multitude. Without a word of preface he raised her veil, when feelings of shame and fear restored strength to the palsied arms. The lady hastily drew her veil down again, and was cured from that hour.

SELECT FORMULÆ.

Antigastralgic Drops. — The London *Chemist and Druggist* gives the following as M. Niemeyer's formula: —

Tincture of nux vomica . . .	4 grammes.
Tincture of castoreum . . .	4 "

Mix. Two drops to be taken during the spasm, in half a cupful of infusion of valerian. Hot applications to the pit of the stomach.

Liquid Dentifrice. — The same journal gives the following as a valuable liquid dentifrice: —

Fine potash soap	3 oz.
Cream of tartar	1 drm.
Alcohol, sp. gr. 0.910	18 oz.
Distilled water of any desired perfume .	6 oz.

Digest and filter.

A Cheap Fumigator. — The following will be found to be a cheap and pleasant fumigator for sick-rooms, diffusing a healthful, agreeable, and highly penetrating disinfectant odor in close apartments, or wherever the air is deteriorated. Pour common vinegar on powdered chalk until effervescence ceases, leave the whole to settle, and pour off the liquid. Dry the sediment and place it in a shallow earthen or glass dish, and pour upon it sulphuric acid until white fumes commence arising. This vapor quickly spreads, is very agreeably pungent, and acts as a powerful purifier of vitiated air.

A Local Anodyne. — The *London Lancet* gives the following formula for a convenient local anodyne: Take of elastic collodion one ounce; hydrochlorate of morphia, fifteen grains. Dissolve the morphine salt in the collodion. Spread with a camel's-hair brush some of this solution on the painful part, and place some oiled silk over the spot. The effect is stated to be most satisfactory.

FACETIÆ.

Western Calomel. — "Many years ago," said the President of the American Pharmaceutical Association, in the course of his address at St. Louis, "when this great Western country depended on the Eastern markets for merchandise of all kinds, a Western merchant in an Eastern city concluded to take a dose of calomel, and accordingly purchased an ounce of that sovereign remedy, of which he took a teaspoonful, and retired. Very soon he was taken ill, and a physician was summoned, who, on examining his patient, recognized symptoms of poisoning. After much inquiry he learned the cause, and was very much astonished to hear from the merchant that one teaspoonful of calomel was his usual dose when at home. The physician repaired to the drug store from which the medicine had been sold, and after explaining the case to the pharmacist, received the following interrogatory: 'Why in the devil did he not ask for Western calomel?'"

On the Wrong Track. — The Count de Grasse was once wounded in the knee with a musket-ball. The doctors cut and hacked and made many incisions, when, getting out of all patience, the count asked why they cut him up so much. "We are seeking," said the surgeon, "for the ball." "Why did n't you mention that before? I have the ball in my pocket."

Doctors' Carriages. — A venerable physician of Philadelphia, Dr. Condie, the author of a book on Diseases of Children, would never keep a carriage, notwithstanding his large practice, and is made responsible for this *mot:* "If a doctor drive one horse, it indicates physical weakness; if he drive two, mental weakness."

ABUSE OF EMINENT CHEMISTS AND PHYSICIANS.

The May number of the Chicago *Pharmacist* contains an editorial which grossly insults several of the most eminent chemists in the United States. It is stated upon the cover of this journal that it is published by the Chicago College of Pharmacy, and edited by Albert E. Ebert. There are in the city of Chicago many respectable and educated druggists, and some one of them should conduct their publications in a reputable manner.

It is not to be supposed that Professor Chandler, of Columbia College, or Professor Genth, of the University of Pennsylvania, or Professor Sharples, State Assayer of Massachusetts, or Professor Wheeler, of Chicago, will be very seriously concerned for their reputations on account of this unmannerly attack. A journal conducted by a man whose incompetency and falsehood these chemists have been called upon professionally to expose, hardly rises to the lowest level of questionable respectability, and of course no notice whatever will be taken of the man or of his publication. Still, the insult is exceedingly gross and malicious. These eminent gentlemen, who are known throughout the world for their high character and scientific attainments, are accused directly and indirectly by this nostrum-maker in Chicago, of venality, fraud, and corruption. They are indirectly accused of signing statements of the results of analysis, which they never made. They are charged with "gross prostitution of chemical science."

Here is a sentence: "For the honor of American chemists, we trust some one of these *wise* men will arise and explain by what process" they were able to show the presence of the various alkaloids in cincho-quinine. Dr. Genth, Professor Chandler, called up before this charlatan to inform him how they do their work, and that too on the ground of assumed incompetency or dishonesty! Was there ever a more ludicrous exhibition of impudence and conceit? Would it not be well for this charlatan first to inform the Pharmaceutical Association by what process he reached the conclusion that the agent "contained *not a trace* of anything but cinchonia"? Not a word of explanation as regards "his process" was presented at Louisville, for the very good reason that he had no "process." He is very fond of asking distinguished gentlemen in the medical and chemical professions to "arise and explain." The medical profession generally, and Dr. Bowling, of Kentucky, President of the American Medical Association, in particular (a most estimable and eminent physician), have been insulted frequently by this man, in the *Pharmacist*.

Now this man is, or was, a very obscure and insignificant person, and his character and acts, unless he violated statute law, of no special consequence to the public at large. But his character and acts *do concern* the body or bodies with whom he is identified. If he is allowed without rebuke to vituperate through official organs, or before scientific organizations, in coarse, unscientific language, every person and every thing to gratify personal spite, he so far compromises the reputation and good name of those with whom he acts. Certainly, neither the Chicago College of Pharmacy nor the American Pharmaceutical Association can afford to sustain such a man. It is honorable to the latter organization that intimations have been given, by some of the oldest members, that at the meeting in this city next September, a movement will be made to promptly expel him. This would be but a simple act of justice to the association and the many parties whom he has assailed. The same number of the *Pharmacist* which contains the abusive article noticed above also contains an advertisement of "Ebert's Pharmacy" *for sale*. He states that he is "going to *withdraw* from the business." This result might reasonably be expected.

It is not pleasant to be compelled to be in any degree personal, but in this instance the provocation has been extraordinary, and this is our apology. He has maligned pharmaceutists, eminent chemists, and physicians, and his moral sense seems to be so obtuse that he can only be reached by the lash of the law. It must be a relief to the honorable and respectable pharmacists of Chicago, when such a man leaves the profession.

CINCHO-QUININE.

Two druggists of Louisville, Ky., Messrs. Scheffer and Diehl, having published in the *Journal of Pharmacy* an article upon Cincho-Quinine, the manufacturers, Messrs. Billings, Clapp, & Co., publish in the May number of that journal the following reply: —

Boston, *April* 15, 1875.

Editor American Journal of Pharmacy:

Dear Sir, — Our attention having been called to a communication by Messrs. E. Scheffer and C. L. Diehl, in the April number of the *American Journal of Pharmacy*, purporting to be a chemical examination of cincho-quinine, we desire to remark briefly as follows: —

The agent was introduced to the profession in 1869, since which no change whatever has been made in its composition. During this period it has been examined by four pharmacists: 1st, by Mr. W. T. Wenzell, of San Francisco, in 1870; 2d, by A. E. Ebert, of Chicago, in 1874; and lastly, by Messrs. E. Scheffer and C. L. Diehl, of Louisville.

The result of Mr. Wenzell's analysis was the discovery of two substances or principles which the agent *did not contain*, and he failed to discover quinia, quinidia, or cinchonidia. Mr. Ebert was able to discover only cinchonia, failing utterly to find quinia, quinidia or cinchonidia. Messrs. Scheffer and Diehl find quinia, quinidia, and cinchonia; and they remark (page 159) that, "if it contains cinchonidia, it can be present only in small quantities, and they did not search for it."

The widely different conclusions reached in the qualitative examinations made by these gentlemen must lead the reader to conclude, with us, that when an agent is made up of such complex and delicate organic principles as are found in barks, and the tests and reactions involve deceptive color-tints or forms of crystals with such varying solubility, and when these tests are so frequently fallacious and unreliable, the pharmacist and the chemist should be careful in expressing positive opinion respecting the results of their investigations when they differ from the statements of the manufacturer, who certainly has the most reliable knowledge upon the subject.

As manufacturers of the article, we unhesitatingly say that never has a phial of the agent left our laboratory constituted in correspondence with the quantitative results reached by the Louisville gentlemen, and, in saying this, we distinctly disclaim any purpose of charging them with intentional false statements.

In our circulars we have stated cincho-quinine to be the bark alkaloids quinia, cinchonia, quinidia, cinchonidia, and other alkaloidal principles present in Peruvian barks, and it contains no substances but those naturally existing in bark. By this, we wish to be understood as stating that cincho-quinine is a new method of presenting the bark alkaloids, and is unlike any other product which may be substituted by physicians for sulphate of quinine.

In conclusion, we are convinced that no more certain proof of the remedial value of cincho-quinine could be given than its growing popularity with the medical profession, and the attention given to it by the pharmacists of the country; and while their published analyses, both qualitative and quantitative, differ widely from each other, *and all are incorrect*, it is yet a source of satisfaction to us that the more exhaustive their labors, the more nearly do they approach to our statements regarding its nature and value.

Billings, Clapp, & Co.

NEW AND IMPORTANT TESTIMONY REGARDING CINCHO-QUININE.

It is wonderful what an amount of interest has been created regarding this important agent. Professor Maisch, of the *American Journal of Pharmacy*, remarks at the close of his article in the May number: "If now, through this controversy the attention of the medical profession shall have been called more prominently than heretofore to the value of the cheaper cinchona alkaloids, we shall acknowledge with pleasure that a real benefit has been conferred thereby upon those who need these alkaloids, either as tonics or antiperiodics." This is as generous as it is true. The introduction of cincho-quinine has done a great and good work, in placing in the hands of physicians a peculiar combination of the cheaper alkaloids of bark, by which great advantages are gained, both as regards better therapeutical effects and lower price. A correspondent of the Nashville *Pharmacal Gazette* is disposed to ridicule Scheffer's and Diehl's labors. They are certainly open to severe criticism. We present the article of the correspondent, with the remarks of Prof. B. Lillard, Ph. D., the editor; also the views of several journals, physicians, and chemists. Much good will be accomplished by this discussion, as it will bring to the notice of many physicians a valuable agent which will be more highly esteemed the longer it is employed.

From the *Pharmacal Gazette*, April, 1875.

Since the publication of the proceedings of the American Pharmaceutical Association, with the article on Cincho-Quinine, by Mr. A. E. Ebert, of Chicago, and the showing by its makers that Ebert's statement was entirely false, the subject has assumed some interest and importance, and I am not surprised that it has received some attention from the inventor of the "time-honored" "Scheffer's process." What struck me forcibly was that he got too many, and in fact all, of his main results by difference. The quantity of cinchonia should have been determined by direct demonstration. His calculation for water of hydration is simply based on the supposition of its expulsion by the temperature of boiling water, which is well known to fail in a great many cases. . . . Then, in his remarks on page 151, he proposes to show the exact quantities of the alkaloidal sulphates present; but, in his whole work, he does nothing of the kind. . . . He lays special stress upon determining the amount of quinia, and in this he has concocted his most indigestible coagulated failure. Two of his results from sample No. 1 show a difference of 9½ per cent., and when a variation of 1 per cent. is usually considered quite significant, I can only think of the extreme saccharation of the author. The same remark will also hold good for the mode of obtaining the quantity of quinia given on page 157. It is a well-established fact that a certain volume of water, which can be saturated with a definite quantity of two substances, separately, will not always dissolve the same amounts when the articles are mixed. It has been often shown in reference to organic bodies that they mutually aid each other's solution, and that sometimes relatively immense quantities of one of two will dissolve in water when both are together, and that when separately treated with the same volume of water they would be sparingly dissolved, if at all. Then, there are numerous cases where one salt, added to a saturated solution, will completely precipitate another. Again, in No. 4, A_4, he found that the washings contained no alkaloids; but in D_2 quinia was obtained from the aqueous filtrate from the undissolved portions of the Cincho-Quinine; and as the quinine was taken out by ether in one instance, and not in another, it looks a little queer, as in the first instance it had the help of ammonia. . . . Poor Ebert seems to be getting it on all sides,

and doubtless he "even wishes he were dead;" but it was right hard for him to be saccharated by the expression that "Ebert had *read* an examination." On the whole, I do not see that Cincho-Quinine has been worsted by going through "Scheffer's process," and I truly hope, in behalf of an indigestible public, that the process, on account of its peculiar coagulated saccharation, will not be seriously damaged by the contact. It has been reported that Professor Diehl had something to do with the examination, but I suppose it only means that he exercised a fatherly supervision over the "time-honored" saccharometer. PILROLER.

At the present time Cincho-Quinine is the best advertised of all similar preparations; and, in order that all sides may have a fair chance, we give place to three articles on the subject in this number. The question as to the relative proportions of the various alkaloids is an interesting one, and seems to have taken the place of the "time-honored" query, What is Cincho-Quinine? Now that it is demonstrated beyond doubt that Ebert was wrong in the analysis he "read" at Louisville, the question naturally arises, Is the statement of the manufacturers, in reference to this preparation, true or false? They describe it as "containing all the important constituents of Peruvian bark, in their alkaloidal condition." They do not claim, or infer, in any way, so far as we have seen, that the alkaloids exist in the average proportions that are found in good cinchona bark; and a supposition of this kind, without sufficient proof, is an injustice to the manufacturer. It has been fairly demonstrated * that quinidia is more effective than quinia, and that cinchonidia only lacked three, and cinchonia sixteen, out of a thousand cases, of being as effective as quinia. With this information, it is not strange that an enterprising establishment should have combined the alkaloids in reference to a certain therapeutic effect — that of cinchona bark, without the unpleasant symptoms of quinia. It might have been better for its makers to have published a statement of this kind, and, at the same time, a working formula, with practical hints as to the best way to proceed on a small scale, so that every physician and druggist could have easily made it for himself; but they seem to have chosen a different plan, and in so doing have done nothing more or less than hundreds of other manufacturers are doing every day.

We desire to have it clearly understood that we are strongly opposed to pharmacal quackery of every kind; and as to what should or should not be so considered we hope to discuss at some future time; at present, it is only necessary to say that there can be no quackery without *deception*, either expressed or signified in some subtile way. And in this case, in order to make Cincho-Quinine a humbug, it must be shown that it is claimed or implied that it contains all the alkaloids in their usual average natural proportions.

If it is desirable to have a preparation of this kind — one that possesses the good qualities of Peruvian bark without the bad effects of quinine — it would seem an easy matter to devise one; or, Cincho-Quinine could be analyzed, and its preparation made as easy as any of the *pulveres* of the pharmacopœia. — *Ed. Pharmacal Gazette.*

From *The Virginia Medical Monthly*, April, 1875. Landon B. Edwards, M. D., Editor and Proprietor, Richmond, Va.

Mr. A. E. Ebert, of Chicago, in his paper "What is Cincho-Quinine?" says it is simply the alkaloid cinchonia. This statement is at variance with analyses of Prof. F. A. Genth, University of Pennsylvania; Prof. C. Gilbert Wheeler, University of Chicago; Dr. S. P. Sharples, State Assayer of Massachusetts, and other distinguished chemists, who declare it to contain quinine, quinidine, and cinchonine.

But without the evidence these chemists present, any scientific paper with such bitter invectives as characterize this of Mr. E. loses much of its value or importance, for he who seeks the *truth* does not know how much is to be attributed to malignant prejudice. Mr. E. undertakes to lecture the medical journals of the country, "with but few honorable exceptions," and charges that each medical journal "favored with a page of advertisement" was required "to give the article an editorial 'puff,' or an indorsement, by reprinting, as selected matter, . . . a communication . . . extolling the virtue of this nostrum." *This is not true.* In our June number, 1874, p. 59, we published an extract on Cincho-Quinine, which did take "the rounds of the medical press," but no "bait" was held out to us that "*If you insert among the reading matter of your journal this article, we will give you a page of advertisement,*" nor was any fee or reward offered or expected for the extract made. Our "reading pages" are devoted to the interests of our subscribers, while the advertising pages are devoted as wholly to the benefits of our advertisers, and we would be glad to know that each one feels himself repaid. — ED.

From *The American Practitioner*, April, 1875. David W. Yandell, M. D., Theophilus Parvin, M. D., LL. D., Editors. Louisville, Ky.

Our clinical experience in the use of the Cincho-Quinine having led us to think favorably of it as an antiperiodic, we confess to having experienced no little surprise when Mr. Ebert, of Chicago, stated before the American Pharmaceutical Association, at its meeting in this city in August last, that the compound contained neither quinine, quinidine, nor cinchonidine, and was therefore worthless. We were unwilling to allow that we had been deceived in the estimate we had formed of the powers of the drug, nor could we believe that Messrs. Billings and Clapp would originate a fraud. It now appears that Mr. Ebert fell in some way into an error, as a printed circular recently received contains the certificates of a number of leading chemists in different cities of the Union, in all of which it is positively affirmed that the Cincho-Quinine contains the several alkaloids as stated by its manufacturers. We are glad to have our good opinion of the drug sustained by such competent authority.

* *Pharmacographia*, page 328

From *The Indiana Journal of Medicine*. Indianapolis, Indiana. Thad. M. Stevens, M. D., Editor. April, 1875.

We call particular attention to the card of Billings, Clapp, & Co., in this number, touching the question as to whether there is quinine in Cincho-Quinine, a preparation of these gentlemen. The report from chemists seems to be conclusive. We know that whether there be quinine or not contained therein, it is a very good and certainly efficient article in many cases, acting well where other preparations fail. We speak from experience.

From *The Medical Herald*, Leavenworth, Kansas. Tiffin Sinks, M. D., Editor. April 1, 1875.

Two years ago we published an article in reference to Cincho-Quinine, its composition, therapeutic properties, etc. In our experience it has proved to be all its manufacturers claim for it, and we therefore take pleasure in publishing the following card, more especially as this article has been the subject of some hostile criticism. We, as a profession, are largely indebted to manufacturing chemists for the many elegant pharmaceutical preparations now in common use, and there is no better method of encouraging progress in this direction than by cheerfully bearing testimony to the value of those deserving of commendation.

A CARD. We desire to call the attention of the Faculty to the following analyses of Cincho-Quinine from some of the most eminent chemists. BILLINGS, CLAPP, & CO.

Chemical Laboratory of the University of Pennsylvania,
WEST PHILADELPHIA, *January* 29, 1875.

MESSRS. BILLINGS, CLAPP, & CO.:

GENTLEMEN, — I have received by express a package marked "Sealed by S. P. Sharples, January 22, 1875," and containing a bottle of Cincho-Quinine with the label of James R. Nichols & Co., Chemists, Boston, which I have tested, and have found it to contain *quinine*, *quinidine*, *cinchonine*, and *cinchonidine*.

Yours respectfully, F. A. GENTH,
Professor of Chemistry and Mineralogy.

Laboratory of the University of Chicago,
CHICAGO, *February* 1, 1875.

I hereby certify that I have made a chemical examination of the contents of a bottle of Cincho-Quinine, and by direction I made a qualitative examination for *quinine*, *quinidine*, and *cinchonine*, and hereby certify that I found these alkaloids in Cincho-Quinine. C. GILBERT WHEELER,
Professor of Chemistry.

From the *American Medical Journal*, St. Louis, Mo. Geo. C. Pitzer, M. D., Editor. April, 1875.

It is scarcely worth while to add that we fully concur in all that is said about Cincho-Quinine in the above card, and regard it as one of the most valuable additions ever made to our materia medica.

From the *Philadelphia Medical and Surgical Reporter*. Edited by D. G. Brinton, M. D. April 3, 1875.

As the composition of Cincho-Quinine has been discussed in the columns of several pharmaceutical and medical journals, we consider it due to the manufacturers, Messrs. Billings, Clapp, & Co, Boston, to call the attention of the profession to the following analysis of Cincho-Quinine from two eminent chemists, whose reputation needs no indorsement.

From the *St. Louis Medical and Surgical Journal*, Wm. S. Edgar, M. D., Editor. April, 1875.

We give below the chemical analysis of Cincho-Quinine, by competent chemists, as indicating its preference to quinine as a general tonic in many cases.

From the *Atlanta Medical and Surgical Journal*. Robert Battey, Editor, M. D. Atlanta, Georgia, April, 1875.

CINCHO-QUININE.—Elsewhere we present this month the qualitative analysis of this educt from Peruvian bark, over the signatures of analytical chemists of undoubted authority. It is satisfactory to know that a remedy which we have for so long a time kept prominently before our readers in our advertising columns is not the gross fraud which has been charged.

From the *Southern Medical Record*, Atlanta, Georgia. April, 1875.

The chemical analyses of Cincho-Quinine given above certainly prove that it is a valuable preparation, and suggest that, in many cases, it is a superior tonic to quinine. Therefore it should be kept in every drug store.

From the *Indiana Medical Review*, Dr. J. A. Brown, Editor and Publisher, Indianapolis, Ind. April, 1875.

Several months ago we published an article on Cincho-Quinine which gave, as we believed, a true statement of its value as a remedy. Since that time, some wiseacre has seen fit to deny the existence of either quinine or quinidine in the agent; thus setting up his opinion against the views entertained by the great mass of the medical profession, regarding its properties.

To bear us out in our opinion, however, we now have the testimony of many of the most noted chemists in the country, who declare that the drug contains all the properties claimed for it by its manufacturers, Messrs. Billings, Clapp, & Co., of Boston. It is not necessary to publish the certificates of all these gentlemen, but we make room for the following [the testimonials of Professors Genth and Wheeler given above], which are fair samples of the declarations made by the others.

With such weighty evidence before them, the members of the profession who have not already satisfied themselves of its value by trial, will resort to the use of Cincho-Quinine with full confidence in its efficacy.

KIMBALL, BOSQUE CO., TEXAS, *April* 27, 1875.

MESSRS. BILLINGS, CLAPP, & CO.:

GENTLEMEN, — I have been using Cincho-Quinine since 1869, when I could get it from our drug stores, and have preferred it to quinine. It matters but little to the physicians whether it contains quinine or not, or whether Mr. Ebert's statements or views were correct or not, since experience has shown that it has all the good effects of quinine, without the bitterness and unpleasant effects of quinine.

My experience in the use of Cincho-Quinine, satisfies me that it is all that has been claimed for it, and I shall continue to use it, until further trial shall change my opinion of its merits.

M. M. MYERS, M. D.

BRYAN, TEXAS, *April* 21, 1875.

I have used the Cincho-Quinine, in perhaps hundreds of malarial diseases, and in no instance have I known a *failure*.

I prefer it to the sulphate in every respect; it has proved equally *efficient*, and much more pleasant to the patient. I shall still use it, no matter what the chemists say.

C. KENDRICK, M. D.

Luigi G. Doane, M. D., New York, says, March 30, 1875: "Your Cincho-Quinine I have tried with good results in pneumonia. I find it better than quinine alone." Also, April 3, 1875, says: "I am constantly prescribing your Cincho-Quinine. I can say for it that it is safe, pure, and mild in its action. My druggist always keeps it, and would not be without it. If my professional brothers will give it a trial, they will not be disappointed in it."

GRAND RAPIDS, WOODS CO., OHIO, *April* 1, 1875.

GENTLEMEN, — I have practised medicine nearly thirty years in malaria districts; in that time I have used every medicine that was supposed to be antiperiodic, both singly and combined, and I can truly say from the experience I have had with the Cincho-Quinine, that I prefer it to quinine or any other preparation of bark. I have used it in cases where quinine could not have been borne; the Cincho-Quinine did not appear to affect either the stomach or head.

You are aware there is scarcely a disease in a strictly malaria district that is not more or less of a malarial type; it will stick its nose in where you are not looking for it. In these cases is just where the beauty of Cincho-Quinine comes in. I can recommend Cincho-Quinine to the profession in all truth and honesty.

There are hundreds of farmers who have lived and were raised in ague districts, who buy quinine by the quantity, and use it out themselves to their families. This will make a great sale for the Cincho-Quinine. I have recommended all such to try the Cincho-Quinine as much safer, and much easier given to children. Other physicians will undoubtedly do the same.

I sincerely thank you for its discovery.

G. W. BELL, M. D.

PLYMOUTH, WASHINGTON CO., NORTH CAROLINA,
April 8, 1875.

MESSRS. BILLINGS, CLAPP, & CO., — It gives me pleasure to add my feeble testimony to the great value of Cincho-Quinine. It is immaterial to me what others may say of its chemical composition; as long as I can get the same article I used last year I am content

I used it exclusively last year as a tonic and antimalarial remedy, in the same dose as the sulphate of quinine, and prefer it in many respects. It has not in my hands produced the unpleasant head symptoms that usually accompany the sulphate. Its cheapness and more agreeable taste, with its advantages as above stated, will continue to claim the advantages over the sulphate with me.

The only request I have to make is to keep the original article pure. I live on the grand Roanoke, eight miles from its mouth, and have been practising medicine for thirty-two years. Suffice it to say that the Cincho-Quinine, early and efficiently used, will cure malarial diseases.

No sectional prejudice here — it is extending honor where it is due. W. W. WARD, M. D.

COMPOUND SYRUP

OF THE

HYPOPHOSPHITE SALTS.

The importance of the element phosphorus in the human economy has not been appreciated until recently. The amount existing in the brain, as shown by modern investigations, is much larger than was supposed, and its presence must greatly affect the whole nervous structure.

The value of this agent in maintaining a normal condition of the system can be understood by a consideration of the probable fact that in all the operations of the mind, in every effort requiring an expenditure of nervous force, it is called into action. In its rapid oxidation in the brain, on occasions of great intellectual effort, there may be a nearer approximation to literal truth in the remark that there are "thoughts that *burn*," than is generally supposed.

Not only is chemical science capable of pointing out the exact chemical constitution of the body and the changes and transformations which are constantly occurring, but it has proved competent to direct us respecting the proper methods by which certain elements or agents may be furnished, when pathological symptoms indicate an inefficient supply.

The syrup of the hypophosphites of lime, soda, potassa, and iron offers the most direct and philosophical means of supplying phosphorus to the system. The small amount of oxygen in combination with this element in the hypophosphorous acid which unites with the alkaline carbonates (the bases of the salts) is favorable to easy decomposition in the system, while the presence of iron in the combination increases its tonic properties. By the changes which result from further oxidation, nascent phosphorus and phosphates are liberated. The phosphorus thus set free is certainly in a condition most favorable to the fulfilment of its design and high office in the brain and nervous system. Whether the phosphates, as such, or by further change, are capable of exerting specific and desirable influence, must be regarded as a matter of some doubt. The hypophosphite salts should be given in the form of syrup, as they are all more or less deliquescent, and should be placed under the protection of some agent capable of preserving them from change.

Although specifically prescribed for phthisis by DR. CHURCHILL, it is evident that their beneficial effects are not limited to this one variety of disease. They would seem to be most appropriate remedies in a large class of affections resulting from loss of nervous force, and perhaps in cases of mental aberration, not resulting from family idiosyncrasies; also in many of the diseases of infancy where there is want of vital action. A clear understanding of the chemical nature and characteristics of the remedies under discussion will enable physicians to apply them in a large class of diseases where their use seems to be indicated.

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BILLINGS, CLAPP, & CO., Chemists,

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ELIXIR OF PERUVIAN BARK

WITH

PROTOXIDE OF IRON.

A large number of pharmaceutists, chemists, etc., in every section of the country, have endeavored for many years to supplant, in the estimation of physicians, this valuable combination of Protoxide of Iron and Peruvian Bark, by offering substitutes of every conceivable name and form. There are to-day, on the shelves of apothecaries, more than sixty different "Elixirs of Iron," but none of them have proved to be of equal value to the preparation we so long ago placed in the hands of physicians.

A prominent peculiarity and advantage consists in associating iron *not* in a *sesquioxide* condition, but in the more easily assimilable form of a *protosalt*, with all the valuable alkaloids of Peruvian Bark, in an elegant and permanent compound, where the therapeutic properties of each principle remain unimpaired. We unhesitatingly express the opinion that no more pleasant and desirable chalybeate and tonic has ever been offered to the profession; and so far as our knowledge extends, this result (the combination of the *protosalts* of Iron with the active principles of Peruvian Bark) is not attained in any of the numerous preparations crowded upon the public as a substitute and imitation of our compound.

The unusual popularity of this remedial agent with the profession is due to the following facts, — facts which must commend themselves to scientific physicians everywhere: —

1. The presence of iron in perfect solution, and in the form of a protosalt.

2. The combination of all the alkaloids of Peruvian Bark with the protosalts of iron in a solution where the chemical equilibrium of each principle is undisturbed.

3. Attaining this result with the use of the least possible amount of saccharine matter.

4. It is an aromatic cordial elixir, pleasant and acceptable to all classes of patients.

5. There is no valid objection to the free use of the preparation by the profession.

In order that physicians may *prove* the presence of protoxide of iron in the Elixir we give the usual test: —

Pour a small quantity of the Elixir into a wine glass, and add a few drops of ferricyanide of potassium. The instant change of color to a deep blue shows the presence of iron in the form of a *protosalt*.

OUR ELIXIR OF PERUVIAN BARK WITH PROTOXIDE OF IRON is sold in bottles holding one pint, also in two quart and gallon packages. If physicians desiring to prescribe this preparation will direct their druggists to procure the larger bottles, they can order it by prescription in such quantities as they may desire for their patients.

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PNEUMATIC ASPIRATION,

AFTER THE MANNER OF DIEULAFOY.

"It is always possible, owing to Aspiration, to search for a fluid collection without any danger, whatever may be its seat or its nature."
"I have thrust these Needles into almost every part of the body, into the Joints, the Liver, the Spleen, the Bladder, the Intestines, the Lungs, and the Meninges, and I can affirm, and a great number of observers affirm with me, that we have never seen consecutive accidents." — *Dieulafoy on Pneumatic Aspiration*, pp. 21, 24.

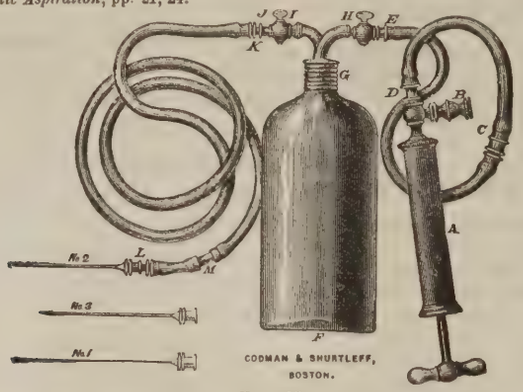

FIG. 68.

DESCRIPTION.

A, Brass Air Pump. *B*, *C*, Chambers containing Valves. By reversing the position of the chambers, the pump may be used at will as an exhaust or as a force-pump. A double milled circle around one end of each indicates, when these circles on both chambers are *towards* the pump, that it is an exhaust pump; when the circles are turned from the pump, that it is a force-pump. The Chamber *C* is reversed by turning it with the tube end for end. *D*, *E*, Metallic Joints or Couplings, either of them fitting the pump or the air-cock, *H*, as required. *F*, Glass Receiver of sixteen-ounce capacity, having a coarse screw-thread cast into the glass of the neck so as to screw into a corresponding thread in the brass cap, *G*, making an air-tight joint by means of rubber packing. *I*, Fluid Cock. *K*, *L*, Metallic Couplings. *M*, short piece of Glass Tube to give early notice if fluid has passed the needle. Nos. 1, 2, and 3, Aspirator Needles, steel, hardened and tempered at cutting point and plated with gold.

We invite the attention of the Medical Profession to this New Apparatus for Aspiration, constructed upon the general plan of Potain's modification of Dieulafoy's Aspirator, but containing the following improvements and inventions of our own.

1st. — Means of changing the pump from an exhaust to a force-pump, and *vice versa*, thereby enabling the operator not only to withdraw an abnormal fluid, but to inject the cavity through the tubes and needle of the apparatus with one adapted to induce healthy action. — *See Dieulafoy on Aspiration*, pp. 276, 278.

2d. — The employment, in our apparatus No. 1, of a metal Screw Cap, fitting the neck of the receiver supplied with this apparatus so securely that it cannot be forced from its place by condensed air while injecting, or accidentally removed while the receiver is in a state of vacuum for aspiration.

3d. — The use of indestructible valves.

Instead of the oiled silk valves of French and other American apparatus, which are almost certainly injured by contact with liquids, — for instance, the accidental and almost unavoidable introduction either of a few drops of the aspirated fluid, or of the oil used for lubricating the pump, — we employ a light metal valve, fitting a metallic seat, the two ground together so as to secure close contact. They are unchangeable in form, and cannot be injured by contact with fluids. If desired, they may be as freely used, and the pump also, for liquids as for air. These valves are readily accessible by unscrewing the valve chambers, and require no care beyond occasionally wiping valve and seat with soft paper or cloth to remove dust or adherent particles, should they fail to work perfectly.

4th. — An attachment for evacuating the contents of the stomach by adaptation to the pump and valves which accompany the aspirator, of a suitable stopper, cocks, rubber hose, and stomach tube. The stopper is of form and size to fit almost any large bottle, jug, or demijohn, such as may be found in most houses.

Thus at half the cost of an ordinary stomach pump, the physician having the aspirator may supply himself with a means of evacuating and of washing out the stomach, equal, if not superior, to any in use hitherto.

Commendations bestowed upon our Aspirators, by physicians familiar with the latest European and American ones, lead us to believe that, in some important particulars at least, they are superior to any.

In his work on Pneumatic Aspirations, Dieulafoy shows the harmlessness of the Aspiratory Puncture and its great superiority to the Exploring Trocar as a means of accurate diagnosis in all collections of Pathological Fluids. It has been used with unprecedented success in Retention of Urine, Reduction of Strangulated Hernia, in Ascites, Hydrothorax, Empyema, Pneumothorax, Effusions into the Pericardium, Serous, Purulent, and Hematic Effusions of the Knee, Hydrocele, Hydatid Cysts, Abscesses of the Liver, and in various other Pathological Lesions.

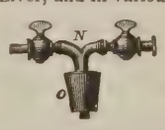

FIG. 69. The Stopper and Cocks supplied with Apparatus No. 2.

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No. 1. Air Pump — exhaust or condensing as described; 16 oz. receiver, of strong glass, with screw cap; three steel, gold-plated Aspiratory Needles, together with the necessary tubes, stop-cocks, etc., as shown in Fig. 68, fitted in a neat case, accompanied with printed directions $18.00

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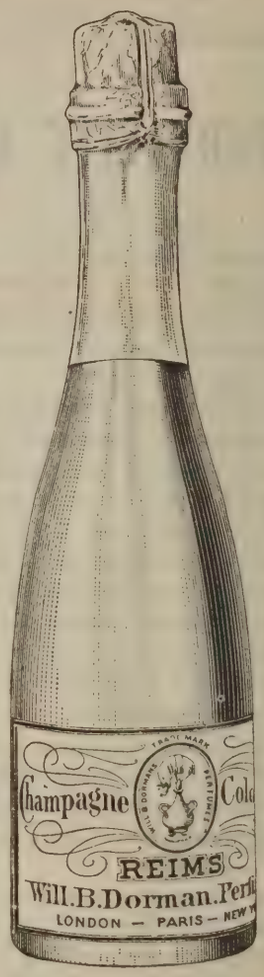

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VOLUME X.

JULY, 1875—JUNE, 1876.

BOSTON:
PUBLISHED BY JOURNAL OF CHEMISTRY COMPANY,
125 MILK STREET.
1876.

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Familiar Science.

THE CHEMISTRY OF OUR FOOD.

II.

THE division of foods into nitrogenous and non-nitrogenous is, as already remarked, a convenient one, though not possessing the full physiological significance that Liebig ascribed to it. Nitrogen is one of the "organogens," and enters largely into the composition of the animal tissues. It is an important constituent of the muscular system, which cannot be built up or repaired without it. It must therefore be supplied to the body in some form or other.

There is no lack of the element in its uncombined form. We live at the bottom of an atmospheric ocean, four fifths of which consists of nitrogen. It is continually surging through our lungs, which inhale and exhale more than four tons of it every year. But of this enormous amount that enters and leaves our bodies, not a single grain is available for purposes of nutrition. It goes out as it comes in, nitrogen pure and simple, answering no other end than to dilute the oxygen, which, though it forms but a fifth of the air, is alone the true "breath of life."

The fact is that nitrogen, if it is to nourish the body, must be supplied in some organic combination. Indeed, this is true of the great bulk of our food, the portion that is inorganic being comparatively insignificant in amount, though indispensable to the welfare of the system. This immutable law of nature is the basis of the relations of the animal and vegetable kingdoms. Animals do not possess the power of converting the elements found in the mineral kingdom into their own bodies; therefore they are wholly dependent for their supply of nutriment upon the vegetable creation. It is the great function of plants to convert mineral matter into those highly complex or "organic" substances which, as has been stated, constitute the chief nutriment of the whole animal kingdom. The vegetable *organizes*, the animal *disorganizes*. The plant takes into its mechanism mineral matters, the constituents of which it recombines, so as to produce from them sugar, starch, woody fibre, and the various other so-called "vegetable" substances. The animal takes into its organism these vegetable substances, reorganizes them into its tissues, or structures, and subsequently disorganizes them, and reduces them to their original mineral or inorganic condition.

It was formerly supposed that organic compounds could be produced in no other way than through the agency of plants. The manuals of chemistry that we studied in our boyhood taught that these compounds could not be made artificially. But modern chemistry has found out how to manufacture hundreds of them, and the number is daily increasing. But this artificial synthesis of organic products has not, as yet, become a rival to nature's machinery for preparing our food. Whether it may become so in the future we cannot tell. Perhaps our descendants in some remote generation may be able to manufacture all the important organic substances required for the sustenance of the body. The laboratory may supersede the garden and the farm, the ploughshare be beaten into the crucible, and the pruning-hook into other implements of the chemist. The occupation of the tiller of the soil will be gone, or at least we shall cease to be absolutely dependent on his labors, as we now are. Even if the chemist shall not be able to compete economically with the farmer in furnishing food for men under ordinary circumstances, his art may be of the utmost value in exceptional cases. The Arctic explorer, for instance, may depend on a compact chemical outfit for his supplies instead of the bulky stores of provisions that he now has to transport; and the shipwrecked mariner on a desert rock will be safe from starvation if he has only rescued his patent food-making apparatus from the sinking vessel.

But this is mere dreaming — though not more visionary than many a triumph of chemistry, familiar to us, would have seemed to our fathers — and we must come back to realities and our nitrogen.

The nitrogenous foods are often called "albuminoids," because albumen may be considered the representative or "type" of the group. The other leading albuminoids are fibrine and caseine, or fibrin and casein, as the words are now more commonly written. Albumen is a solid that cannot be crystallized, soluble in water up to 140° F., at which temperature it coagulates, that is, becomes insoluble. The white of an egg is the most familiar example of it, the boiling of the egg the simplest illustration of its solidification by heat. It is also found in the juices of plants, often in great abundance. Fibrin is a hard, horny substance, the chief constituent of the muscular tissue of animals. It is found in solution in the blood, and coagulates or "clots" soon after the blood is drawn from the body. The gluten of wheat flour is mainly composed of albumen and fibrin, or "vegetable fibrin," as Liebig called it. Casein (which takes its name from the Latin word for *cheese*) is found in solution in milk. It is precipitated or coagulated in the form of curd by acids, and by rennet. "Vegetable casein" is abundant in peas, beans, and other leguminous seeds. There are various other albuminoids, but they all resemble each other so closely that many chemists believe them to be identical in composition. It would be out of place to dwell upon them in this familiar outline of the subject.

Albumen, fibrin, and casein contain from 15 to 17 per cent. of nitrogen, with 53 or 54 of carbon, 20 to 23 of oxygen, and about 7 of hydrogen. The small remainder of about 1 per cent. is made up of sulphur and phosphorus, though some authorities say that there is no phosphorus in casein.

Gelatine is a nitrogenous compound which differs in some respects from those already mentioned. It is obtained only from animal products, especially from bone, and its most striking property is that its solution in water gelatinizes or "jellies" upon cooling. It forms the basis of soups. Chondrin is a similar compound obtained from cartilage, or "gristle." The question whether these substances have any nutritive properties has been much discussed, and settled alternately in the affirmative and the negative. The latest decision reached by a committee of the French Academy of Sciences is in the affirmative, and rests upon so firm a foundation of experiment and research that it is not likely to be reversed again.

It has been said that there is no vegetable gelatine. The jelly obtained from fruits and certain other vegetable substances is wholly different, being a non-nitrogenous compound, known chemically as pectine.

The *digestion* of albuminoids is a complicated process, and in some respects an obscure one. It may perhaps be briefly considered in another connection.

VARIABLE STARS.

WE talk of the "fixed" stars, and to the common eye there seems no more appropriate type of immutability and immobility than the steadfast orbs that look down upon us as they did on the Chaldean astrologers four thousand years ago, grouped in the same constellations, and shining individually with the same degree of brightness, as in that "dark backward and abysm of time." One star differeth from another star in glory, but so it has been since they first sang together at the dawn of creation. It is not easy for us to think of any change in their relative rank from age to age, or in their number or their appointed stations in the heavens.

And yet, when we come to watch them more attentively, we find that, so far from being "fixed" and unchanging, the starry heavens are the theatre of incessant motion and continuous transformation. The firmament, the very name of which implies fixedness, is full of activity and mobility. It is not lifeless, crystallized, inorganic, but a living, ever-changing organism. Its movements are as manifold and as complex as those going on in an animal body, with all its processes of nutrition, circulation, growth, and repair. Let us take a single one of these forms of activity as an illustration — say, the phenomena of variable stars.

Among the stars in the northern quarter of the heavens, almost continually above the horizon in our latitude, is one of the second magnitude in the constellation, Perseus, commonly known by its old Arabic name of Algol. It is not easy to define its position without a diagram,

but the reader, if not already familiar with it, can readily find it with the aid of the star-maps in any elementary or popular manual of astronomy. Having once become acquainted with it, he might look at it again and again without observing anything to distinguish it from its celestial companions. But if he seeks it night after night, the time will come when it will appear to be missing from its accustomed post. Its bright neighbors will all be there, but Algol will seem to have vanished; for one who is not minutely familiar with the heavens will not be likely to notice that a faint star of the fourth magnitude is glimmering in its place. That faint star is Algol, temporarily shorn of his splendor, and if you look again a few hours later you will find him blazing with his former brilliancy. To be more precise, the star is of the second magnitude (as bright as the stars in "the Dipper") for two days, thirteen and a half hours; it then suddenly decreases, and in three and a half hours has faded to the fourth magnitude; it remains thus only about twenty minutes, and in less than four hours more has regained its full brightness, to go through the same cycle of changes again. The exact period in which the variations are completed is two days, twenty hours, forty-nine minutes. As the star is of full brilliancy for more than two days and a half out of this period of less than three days, one may, as we have intimated, look at it a great many times without suspecting that it is variable.

Another famous star of periodic brightness is in the constellation Cetus, or the Whale, commonly known as Omicron Ceti, but sometimes called *Mira*, or the *wonderful* star, a name given to it by the old astronomers on account of its marvellous variations. It differs strikingly from Algol in having a much longer period, and in being of its maximum brilliancy for a very small, instead of a very large fraction of it. Its range of variation is also much greater, being from the second magnitude down to the ninth or tenth (even below the twelfth, some say), so that it is wholly lost to the unaided eye. Algol, moreover, is as regular in its changes as the moon in her phases, while Mira is given to unaccountable caprices in its maximum lustre. It is at its brightest for about fourteen days, and is then usually of the second magnitude; but sometimes it does not come up to the third, while on rare occasions (in 1790, for example) it has risen nearly to the first. Its light then decreases until in about two months it becomes too faint to be seen with the naked eye. After remaining invisible for six or seven months, it reappears and in two months more reaches its maximum. It has been known as a variable star from the sixteenth century, and its period has been found to be between 331 and 332 days.

There are many other variable stars known to astronomers, and more than a hundred have had their changes carefully observed and catalogued. New ones are continually being detected, especially among the smaller stars; and many others are suspected to be variable, but the fact is not yet demonstrated. There is no one of shorter period than Algol; while, on the other hand, there are many whose cycle is longer than that of Mira, extending to five, six, eighteen, and perhaps more than seventy years. There may, indeed, be periods much longer than these, but their length renders it difficult to determine them. Certain stars are known to be slowly increasing in lustre, and others are as slowly waning, but whether these changes are parts of a regular cycle which it will take centuries to complete we cannot tell.

The new or "temporary" stars that have now and then appeared in the heavens, blazed for a time, and then been apparently extinguished, may perhaps be "variables" of long period. The first of these on record was observed by Hipparchus 125 years before the Christian era, and is said to have led him to make the star-catalogue bearing his name. There was another remarkable one in A. D. 389, which for three weeks rivalled the splendor of Venus, then vanished, and has never since been seen. In 1572, a star suddenly blazed out in the constellation of Cassiopeia. When first observed it was as bright as Sirius, and it increased in radiance until it could be seen at midday. A month later it had begun to wane, and in sixteen months it was entirely lost to view. This star was very carefully observed by Tycho Brahe, and it was unquestionably a star, and not a comet. As temporary stars had been seen in nearly the same position in 945 and in 1264, it has been thought not impossible that all three might be the reappearance of the same variable star, having a mean period of about 315 years. If so, its next maximum would occur not far from 1885.

Other extraordinary stars have made their appearance since that of 1572, two of them within a few years — one in Ophiuchus in 1848, and the other in Corona in 1866. The latter was seen of the second magnitude May 12th, and diminished to the ninth by June 9th. Its spectrum was examined, and was unlike that of any other celestial body. It was compound, and indicated an incandescent body surrounded by a luminous gas consisting chiefly of hydrogen. It was suggested in explanation of these phenomena, that some vast convulsion had caused a great outburst of gas from the star, and that the hydrogen in this gas burned and heated to vivid incandescence the solid matter of the photosphere.

The phenomena of variable stars, like Algol and Mira, must be accounted for in a different way, and various theories have been suggested, none of which is perfectly satisfactory. Some have thought that the obscuration is caused by a dark opaque body revolving about the star and passing between us and it; others, that the revolution of a nebulous body might produce the effect; others, that the star itself may not be uniformly luminous, and that as it revolves we see alternately its brighter and darker side. It is obvious that some cases are better explained by one of these theories, others by another; and it is not impossible that all may be true. Our own sun with its periodical maxima and minima of spots, is to a certain extent a variable star, and greater variability may be due to a similar cause acting with more marked alternations of energy.

But we have taken so much space for describing the phenomena (though we have touched only on a few of the more striking as types of the whole class) that we cannot dwell on these attempts to account for them. We have not even mentioned some of the theories that have been proposed; indeed, some — for instance, the hypothesis that certain stars "may have the form of thin, flat disks, and by rotation present to us alternately their edge and their flat side, producing corresponding changes of brightness" — are hardly worthy of serious consideration.

A NEW EARTHQUAKE INDICATOR.

HERE in New England we seldom have any practical experience of earthquakes, for the "shocks" that at rare intervals slightly stir the granite foundations of our native hills are hardly worthy of the name. Certainly we have no special need of earthquake indicators, or "seismometers," as they are called by scientific men. The demand for such an instrument in "the Boston market" would be extremely limited. Our readers may nevertheless be interested in a very ingenious apparatus of the kind invented by Signor Malvosia, of Bologna, which has lately attracted the attention of Italian *savants*. It is described as follows: —

On a slightly inclined board is fixed a spherical cap, having eight grooves, corresponding to the eight principal points of the compass. A little beyond the edge of the cap there is a projecting wooden ring which limits the inclined surface. On the top of the cap is poised a little brass ball, which is slightly flattened at the point of contact. Upon the ball rests, very lightly, a conical weight by a small screw projecting from its base. This weight is suspended by a chain from an overhanging arm, movable up and down on a support at the side. It will be seen that the least shock will cause the ball to topple over. When it does so it will run down one of the grooves of the cap to the inclined plane, at the bottom part of which it finds a hole, and passing into it, causes the discharge of a pistol. But this is not all. Whenever the ball has left its position on the cap, a spring needle, longer than the diameter of the ball, shoots out from the little screw-knob that rested on the ball and catches in that groove of the cap down which the ball ran. Thus the direction is indicated in which the shock has been given; it has been on the opposite side to that in which the needle hangs down. The instrument is said to be very sensitive, and will doubtless render good service in what is now a little understood branch of science.

PURE AIR IN THE DINING-ROOM.

VENTILATION is a subject that has been pretty thoroughly "ventilated" in journals of popular science; but, as we have before remarked, man is the slowest of all animals to learn whatever concerns his physical well-being. There seems to be no simple lesson of the kind that he is more dull in mastering and applying practically than the vital importance of pure air. Of this boon, which is literally "free as air," he wilfully or stupidly deprives himself in most of his in-door life — if life it may be called which is merely a state of semi-stupefaction in a poisoned atmosphere. To this same vile air he condemns the victims of his inconsistent hospitality, for the dining-room is often one of the worst ventilated apartments in the house. On this subject a correspondent of the *Pall Mall Gazette* vents his righteous indignation in the following vigorous way: —

I once was bold enough to prophesy that the day would come when a host would as soon think of setting before his guests tainted meat as of making them breathe foul air. Better, I have always held, is a dinner off a single joint where pure air is, than twenty courses and stuffiness therewith. I never go

to a dinner party without a longing coming over me to send one of the bottles flying through the window; and I find myself regretting the good old days when a chance riot might have brought a few chance stones through the panes of glass. I often find myself considering whether I shall excite more attention by making a rush for the fresh air or by waiting till I fall in a fainting-fit under the table. The hostess, perhaps, remarks to me, "I fear the room is a little hot." "It is rather warm," I mildly reply. Some day, I feel, human nature will be too much for me, and my heart that is hot within me will at length speak out. "Madam," I shall say, "the room is hot; but heat — pure heat — I can stand. The air in this room is more than hot, it is foul. It is far too foul for those animals to have lived in on which we are dining. The very pig who has given us that juicy ham would have drooped in such an air as we are now breathing. You have brought us together to eat dainties got from all quarters of the world, and you clap us all together into a room which would have been a disgrace to a jail in the days even of the philanthropist Howard. I love my neighbor, I hope, but I do not covet his breath; neither the breath of his wife, nor of his servant, nor of his maid. I have not, madam, like so many of your guests, who spend night after night in rooms as close as your own, quite lost that 'play of lungs' in which the poet rejoiced. I am still so little used to the poison of bad air as to know that it might at the present moment with truth be said of me —

> 'With his breath he draws
> A plague into his blood; and cannot use
> Life's necessary means, but he must die.'"

FAMILIAR SCIENCE NOTES.

The Diffusion of Carbonic Acid. — In a paper published in the *Zeitschrift für Biologie*, Pettenkofer alludes to a popular idea that in a badly ventilated room the worst air collects at the bottom, on account of the high specific gravity of carbonic acid. He then gives the details of some experiments which illustrate in a remarkable manner the very great rapidity with which a heavy gas diffuses into another gas with which it is in contact, even when the heavier gas is situated below the lighter. These experiments were performed at a mineral spring at Marienbad, where there is a constant evolution of carbonic acid from the surface of the basin in which the water is confined. This basin is quite large, and is used for bathing; it is covered by a light wooden building, and the evolution of carbonic acid is very considerable. It is estimated that if no diffusion took place, at the end of an hour the building would contain over the surface of the water a layer of carbonic acid twelve feet in thickness. Pettenkofer found the gas escaping from the water contained 70 per cent. of carbonic acid; the air 3 inches above the surface contained 31 per cent. of carbonic acid; the air 10 inches above the surface contained 23 per cent. of carbonic acid; the air 40 inches above the surface contained 2 per cent. of carbonic acid; the air 55 inches above the surface, less than half of one per cent. of carbonic acid. As the carbonic acid is evolved continually, we see how rapidly it diffuses into the atmosphere, or how rapidly the gases of the air diffuse into the carbonic acid layer, so that at a height of 40 inches above the water the carbonic acid amounts to only about 2 per cent. of the volume of the air, and this, too, in a space enclosed by a structure built of boards, and not freely open to the air.

Chemical Energy of Flames. — Experiments have been recently made by MM. Riche and Bondy, to determine the relative chemical "light-strength" of various flames. They arrange the flames studied by them in the following series, the weakest being put first, and the numbers representing it the relative chemical energy: Drummond light, 3; zinc burning in oxygen, 4; magnesium lamp, 5; flame of nitrous gas in sulphide of carbon vapor, 6; current of nitrous gas directed to carbon burning in a vessel, 6–7; current of oxygen, 7; current of oxygen directed to sulphur burning in a vessel, 8. Thus, it appears that the flame of sulphur in oxygen is remarkable for its chemical energy, and is therefore well suited for photographic purposes.

The Sun as an Incendiary. — Two incidents, says *Iron*, have just occurred which more than suggest that some "mysterious" fires may have their origin in the action of the sun on glass. A few days ago the master of the Volunteer steam-tug in Plymouth Sound found that a large hole had been burned in the centre of the covering of his berth, and that the fire had penetrated to the bed itself, which was smoking. It was then discovered that this resulted from the concentration of the sun's rays by the glass "dead lights" in the side of the vessel. The grounds of a new mansion at Paignton are entered through gates richly gilt and ornamented. To protect them temporarily they were covered with canvas. On Sunday afternoon this covering was found to be on fire and was burned, one of the lamps above being broken by the heat. All ordinary theories of the causes of fire failed to account for this one, and it was discovered that the globular lamps of the gate concentrated the solar rays and directed them on the spot where the canvas had been, and thus doubtless occasioned the fire.

The Eruption in Iceland. — A resident in Bardardal, a valley at a short distance west of the locality of the eruption in Iceland, writes to an English journal: "What fearful times we have had of it north here this winter! First we were visited by earthquakes, which in some places terminated all but fatally, and then came the eruption, with its concomitant dust-gloom and fall of ashes. The Dyngjufjöll are incessantly vomiting fire; every day we watch the smoke-column rising to an apparently unmeasured height in the air. The eruption is spreading steadily over the wilderness, and it may be said that the whole region of the Myratn mountains is one blazing fire." Mr. Magnusson, of Cambridge, says: "On March 28th the fall of the ashes was so excessive that it covered the eastern country sides, Jökuldal especially, with a coat six inches at its thickest; and all that day, although it was bright and sunny, the people spent in absolute pitch darkness. Fountains and rivulets were dammed by the ashes, and every mountain stream, always of a crystalline purity in Eastern Iceland, where there are neither glaciers nor *moraines*, ran dark and muddy between banks covered with drifts of ashes. The farmers have fled out of the ash-covered country sides with their cattle in quest of pastures not yet destroyed by the *scoriæ*, but with what chance of saving their live stock does not appear. To all appearance the present eruption seems likely to become a calamitous event for Iceland."

ETHNOLOGICAL MISCELLANIES.

The Physique of Americans. — According to a recent work of Mr. B. A. Gould, Actuary to the United States Sanitary Commission, in which some very interesting figures relative to soldiers in the last war are given, it appears that the Yankee nation, instead of being degenerate and inferior to the European race in point of physical perfection, is far the reverse. The figures adduced show that "the tallest men were from Michigan, Illinois, and Wisconsin; the next tallest, from New England, New York, New Jersey; and the shortest from Scotland, England, Germany." In weight, the men of Kentucky and Tennessee were the heaviest, averaging 150 pounds; England, Scotland, France, Belgium, all between 138 and 139 pounds. The ratio of weight to stature gave in pounds to the inch, Ohio and other Western States, 2.185; New England, 2.31; England and Scotland, 2.118; Germany, 2.168.

Clay-Eaters. — Leusinger, in his "Travels on the Amazon and Madeira," speaks of the appetite for clay shown by the inhabitants of the virgin forests traversed by these rivers. This propensity is common to all ages from childhood to old age, and is so strong that the prospect of a miserable and dreadful death cannot withhold them from satisfying this morbid taste. It is not uncommon to see amongst the negroes employed on the coffee and sugar plantations an unfortunate being working in the heat of the day with an iron mask over his face; this is a clay-eater, whom it is sought to save from his deplorable propensity by this means, and who is never allowed to take off his mask except under proper superintendence. This taste, however, is not peculiar to man in these regions. Many animals, and even birds also show it, of which advantage is taken for hunting purposes. The hunter has only to place himself in ambuscade near a clay pit, on a moonlight night, and he will soon have plenty of sport among the wild boars and roe-deer, as well as the jaguars, which are attracted, not by the clay, but by the desire for a living prey.

Esquimaux and Bears. — According to a recent author, the Esquimaux, low as they are in the scale of humanity, have considerable inventive and constructive skill. Their boats are ingeniously made, and their ice huts are perfect applications of the principle of the arch. But if his account of a device of theirs for killing bears is veracious, the Society for the Prevention of Cruelty to Animals ought to send them a missionary at once. They sharpen the ends of a piece of whalebone a foot or more long, then bend it double, and wrap it closely in fat meat, which is exposed to the air till it freezes. These treacherous pellets are thrown to the bear, who bolts them whole. They thaw in his stomach; the bent whalebone straightens, and the sharp points pierce his vitals whenever he attempts to move.

Roman Kitchen Utensils. — A paragraph in the *Journal de Genève* mentions the acquisition by the museum of that town of a set of Roman kitchen utensils found in a field near Martigny, having probably been buried on account of some sudden alarm. There are thirty articles, mostly in bronze, some of them elaborately worked, reminding one of the beautiful shape and ornamentation of Pompeian vessels. The shovel and pot-hanger do not differ much from modern articles, and there is an earthen mould shaped like a shell, several plates in various sizes, a saucepan with the bottom worn away, a larger boiler, a funnel, two ladles, a stewpan, and vases or ewers, with two handles, one of which bears the representation of two gladiators, and apparently awarded as a prize. There are also two silver ornaments, seemingly of later date, and believed by Dr. Gosse, the curator, to have been used in Christian worship. He attributes the articles to the third century.

To Remove Mildew. — We have several times been asked for a reliable recipe for the removal of mildew. We doubt whether there is any method that is infallible in all cases; but the following, which we find in an English journal, will often prove effectual: Make a very weak solution of chloride of lime in water (about a heaped-up teaspoonful to a quart of water), strain it carefully, and dip the spot on the garment into it; and if the mildew does not disappear immediately, lay it in the sun for a few minutes, or dip it again into the lime-water. The work is effectually and speedily done, and the chloride of lime neither rots the cloth nor removes delicate colors, when sufficiently diluted, and the articles rinsed afterwards in clear water.

Practical Chemistry and the Arts.

TOUGHENED GLASS.

The "tempered" or "toughened" glass, to which we alluded briefly in the Journal for April, is attracting great attention in Europe. It is destined, we believe, to revolutionize the glass manufacture, and to come soon into every-day use. It has already been made in sufficient experimental quantities to prove its applicability to all purposes for which glass is now used, and to many others for which it would have been employed if it were not for its fragility. Vessels manufactured of the toughened glass, though not distinguishable in appearance from those to which we are now accustomed, may be thrown about with the utmost carelessness, but no ordinary risks will injure them. With a tender thoughtfulness for long-suffering housekeepers, the inventor proposes especially the manufacture of plates and dishes, cups and saucers, and such like articles, either transparent or enamelled. To have these no longer liable to fracture is an important amelioration in domestic economy; but the toughened glass is likely to prove of value in much wider spheres. It will stand any amount of heat, and vessels made of it can be placed on the fire without danger. Consequently, its employment in chemical factories in the place of lead, earthenware, platinum, and silver, is a question of time only. Glass pipes will probably replace those of lead for water and for other purposes, and thus diminish the chances of lead-poisoning. Indeed, it is difficult to anticipate the limits of the application of this very remarkable discovery. The one purpose for which at present there seems some difficulty about employing the new material is for window-panes, for it cannot be cut by a diamond, though the glass may be cut first and toughened afterwards. It can, however, be engraved by the ordinary methods, and cut on the wheel.

Essentially, the process consists in heating glass nearly up to the softening point, and then plunging it into a bath of oil or grease. But to bring it to perfection has needed the patient experience of seven long years. M. Bastie, who is a gentleman of fortune, is said to have made his discovery first some seven years ago. This was after many years of investigation. But though he seemed to have succeeded for the moment, it took two years more of continual experiments before he could repeat his success. The invention has been patented in all European countries, and soon will be throughout the civilized world.

ANILINE INKS.

Although the aniline colors are capable of yielding a number of inks of various but equally brilliant hues, the violet is the only one which has acquired any considerable popularity. With a few precautions, however, it is quite possible to produce other colored inks as good as this. The mistake usually made is in employing a solution too strong. This leaves on the writing a metallic tint, which annoys the reader as well as the writer. No really good black aniline ink has yet been prepared, and the pads of blotting paper soaked with aniline black, which were recently recommended to travellers in a paragraph with the authority of Dr. Böttger, which went the round of the press, are worse than useless. They half dissolve, but leave floating in the solution a quantity of fibres with a strong affinity for pens, and the consequence is continual irritation to the writer. According to the London *Chemist and Druggist*, a good red aniline ink can be made by dissolving 1 part of diamond fuchsine in from 150 to 200 parts of boiling water. About 6 parts of a thick solution of gum arabic, perfectly clear, may be added if desirable. But it is very essential for the quality of this ink to use the *diamond* fuchsine; the other kind yields a very unsatisfactory product. A magnificent green ink, far superior to that made from verdigris or other metallic greens, is made by dissolving 1 part of iodine green in about 100 parts of boiling water. If the tint is too bluish, picric acid will turn it to a yellower shade. A fair blue ink is made from the aniline salt known as Paris blue, 1 part in 200 or 250 of boiling water. Violet ink is prepared by dissolving 1 part of aniline violet in 300 parts of boiling water. All these inks, it should be remembered, are very delicate and easily spoiled by admixture with other coloring matters. If a pen used for ordinary ink is dipped into an aniline ink, the latter loses its brilliancy and the color soon fades entirely.

THE SCIENCE OF ADULTERATION.

BY S. P. SHARPLES, STATE ASSAYER.

VI.

Some months ago, in examining a specimen of cream of tartar, I found two or three per cent. of gypsum along with a considerable amount of rice flour. I was at a loss to understand how the gypsum came to be there. It was not in sufficient quantity to pay for its addition as an adulterant, and the adulteration was evidently rice flour. On looking the matter up I found that an adulterated article of rice flour containing from 15 to 20 per cent. of gypsum was on the market. This at once accounted for the gypsum in the cream of tartar. The manipulator, wishing to buy his rice flour as cheaply as possible, had bought the adulterated article.

Powdered sugar has been long notorious for its adulterations, but granulated sugar is generally supposed to be all right. I was recently, however, shown an article prepared from rice, which was not to be distinguished from granulated sugar by color or general appearance. It was said that this article was used for adulterating a particular grade of granulated sugar that was sent West to be used by the confectioners for manufacturing the powdered sugar.

Rice flour seems to be an extremely useful article in this branch of business. Hassal gives a list of no less than ten different substances in which it has been detected, and yet his list is not a full one. It has the great advantage over common flour that it does not cake when packed and become clammy. It thus more nearly resembles the various spices and other articles with which it is mixed.

This adulteration can only be recognized by the microscope. The starch grains of rice are very small and angular; they polarize very slightly.

The adulteration of bread with alum has attracted a great deal of attention in England, and it seems also to be practised to some extent in this country. Numerous methods have been given for the detection of the alum, but none of these seem to be as satisfactory as the analysis of the ash. All the other methods are liable to error.

NEW THINGS IN THE ARTS.

An Enamelled Ceiling. — Among the decorative works in majolica, mosaics, *sgraffito*, stained glass, etc., which were originated in the South Kensington Museum some years ago, but which have lately been going on slowly or been actually suspended, is a ceiling made of thin plates of iron and enamelled. This ceiling has just been put up in its place in the central refreshment room, and is probably the first experiment of the kind which has been attempted. The decorations of this room were designed to resist all dirt and impurities incident to a public room where food is eaten by an average of 10,000 persons a week. The walls and columns are of majolica, the floor is paved, and the ceilings are of iron enamelled. The whole gives an impression of perfect cleanliness, and every part might be washed down by a fire-engine weekly, if necessary. The iron ceiling was designed and painted by Mr. James Gamble, a successor and pupil of the late Godfrey Sykes, who practically founded the school at the museum. The artistic work of the ceiling was done at the South Kensington Museum, until the action of the decorative studio was virtually suspended. The manufacturing part of this ceiling was done at Birmingham by the Enamelled Iron Company, the white enamelled plates being sent from Birmingham, and painted with charming and vigorous arabesques by the artist. The work is highly effective and the experiment successful. In cases where it is necessary to keep a ceiling clean and to wash it frequently, this material promises to answer perfectly, and the artistic work will last for centuries, as the design is burnt into the enamel.

A New Method for Inlaid Wood-Work. — A very ingenious method of making inlaid or mosaic work in wood has lately been introduced. Two contrasting kinds of veneer, say bird's-eye maple and black walnut, are laid one on the other, and confined between the covers of white wood or something similar. The desired design is then cut through the whole by a fine jig-saw, hardly larger than a horse-hair. The part that is cut out of the light-colored veneer is then set into the place of the corresponding part in the dark veneer, and *vice versâ*, and glued firmly upon the article to be ornamented, in the usual manner of veneering.

Preservation of Wood. — M. Lostal, railway contractor, has communicated to the Society of Mineral Industry at St. Étienne the results of his observations on the effect of lime in preserving wood, and his method of applying it. He piles the planks in a tank, and puts over all a layer of quicklime, which is gradually slacked with water. Timber for mines requires about a week to become thoroughly impregnated, and other wood more or less time, according to its thickness. The wood acquires remarkable consistency and hardness, and, it is said, will never rot. Wood has been prepared in this manner for several mines, so that the plan will shortly be tested on a considerable scale. Beech-wood has been prepared in this way for hammers and other tools for several iron-works, and it is said to become as hard as oak without losing its elasticity or toughness, and to last much longer than when unprepared. It has long been known that wood set in lime or mortar is preserved from decay, but no systematic plan for its preservation has until now been attempted.

Defusilizing and Clarifying all sorts of Liquors. — The following description of a powder for clarifying liquors and removing the fusel

oil, is given in *Dingler's Journal*. It is the invention of Franz Plattner of Dittersdorf, in Bavaria. After the digestion of the proper ingredients for the manufacture of any given liquor with common potato whisky is finished, and a sufficient quantity of so-called farina sugar has been added, the liquor is decanted or racked off, and to every eight litres there is added one ounce of pure starch, one half ounce of prepared albumen in an extremely fine powder, and one half ounce of milk-sugar; the whole is well shaken several times and left standing for twenty-four hours. At the end of this time the liquor thus prepared is so clear that it requires no filtering, has a peculiar lustre, and is so free from every trace of fusel oil, that it is superior in fineness and flavor to any imported from France and Holland.

LIQUID PARCHMENT. — According to Dr. Hofmann, a fluid by this name, consisting of gutta-percha softened and soaked in ether, is especially adapted for forming a coating for pictures and cards, as it permits the removal of dirt with a moist rag. Pencil and crayon drawings may be rendered ineffaceable by sprinkling them with this liquid by means of an atomizer, an exceedingly delicate film remaining after the evaporation of the ether.

PRACTICAL RECIPES.

WATER-PROOFING WOVEN FABRICS. — The London *Chemist and Druggist* says that a good process for water-proofing cloths is to dip them in a solution of sulphate of alumina or alum cake, and afterwards in a warm solution of white Castile or curd soap. Ordinary soap may answer for dark cloths, but white soap should be used for white or light-colored goods. The cloths are then rinsed in clear cold water, and allowed to dry. The chemical reaction is simple enough: soaps are mainly composed of stearate of soda, which, on being rinsed with sulphate of alumina, forms sulphate of soda; that disappears in the washing, and an insoluble stearate of alumina is formed, which remains on the cloths and renders them water-proof.

IMPRESSION WAX. — A foreign journal gives the following recipe for an "impression wax," in response to an inquiring correspondent: "1½ pounds beeswax, 18 ounces Venice turpentine, 1 pint best sweet oil, 1 pint linseed oil, a lump of hog's lard twice as big as a walnut, and as much best white flour as will make it properly stiff. Dissolve the wax and lard in the oils and turpentine over a *slow fire*, so as not to let them *boil;* then add the flour, and work it well. It will last for years with occasionally kneading it, and should be kept in a cool place in summer and temperate in winter. We have some that has been made more than twenty years."

BAG-MARKING INK. — A correspondent of the *English Mechanic* gives the following recipe for an ink, the permanency of which he says is perfect, even when bags filled with chemical manures have been in rain and sunshine over ten days: Boil 1 lb. of logwood chips in 1 gallon of water at boiling point ten minutes, then stir in the eighth of an ounce of bichromate of potash, and boil this ten minutes longer, then add, when cold, ½ lb. of common gum, previously dissolved, and stir well in. This will flow well from the pen, and will mark bags with either the stencil plate or block. The cost of above ink is about 6d. (12 cts.) per gallon.

IMPROVED DRAWING-INK. — The *Manufacturer and Builder* says that the addition of one part of carbolic acid to eighty parts of the fluid India-ink, while it does not impair its fluidity, causes it to dry rapidly even in heavy lines, so that they can be varnished over. The proper amount of carbolic acid to be added in any case may be ascertained by adding drop by drop the ordinary apothecary's solution of it in alcohol, until varnishing does not affect the definition of a test line by causing it to run. The addition of too much carbolic acid is indicated by the transparency of the line and the inability to draw fine lines, a condition easily remedied by the addition of more of the fluid ink.

LABORATORY NOTES.

TEST FOR LEAD IN WATER. — The London *Sanitary Record* quotes the following method of testing for lead in water described by MM. Mayençon and Bergeret. Plumbic sulphide is slightly soluble in soft water, and in water containing an excess of sulphydric acid. If an excess of this gas be passed through a lead solution and then filtered, the clear filtrate will contain lead, as can be proved by passing a galvanic current through it, when the negative platinum electrode will be found covered with lead. It is converted into chloride, and tested by potassic iodide.

TREATING CORKS WITH PARAFFINE. — Corks saturated with paraffine are used for corking bottles containing alcoholic or caustic liquids. Ruschhaupt prepares them as follows: Paraffine is fused in a suitable vessel, the dry corks are added and immersed in the paraffine by means of a perforated cover or disk. The air is now easily expelled from the pores of the corks, which, after about five minutes, are removed and cooled. They may now be cut and bored like wax, are easily driven into the necks of bottles, and readily removed, retain their smoothness, and are gas-tight throughout.

Agriculture.

THE INFLUENCE OF FERTILIZERS ON THE GERMINATION OF SEEDS.

THE disappointments which farmers so often experience in the use of the different kinds of fertilizing substances result unquestionably, in a great degree, from not understanding how properly to employ them. It was our design to call attention in this number of the JOURNAL to the results of some experiments with three or four different fertilizing agents, regarding their immediate effects upon seeds when brought in contact with them in the soil. These results so exactly correspond with those reached by Mr. A. Harwood, of England, as published in a recent number of the London *Agricultural Gazette*, that nothing we have seen in agricultural literature for a long time has interested us more. We lay aside for the present our notes, and give below Mr. Harwood's statements in full, as they are so definite and well presented. Hundreds of farmers have planted seed, bringing them in contact with fertilizers, and they never appeared above ground, being killed during the process of germination. The seed producing the heavy crops of corn we have raised during the past ten years by the aid of artificial manures, was always *placed on the soil above the manure*, and the manure exerted no influence upon the plant whatever, until the roots were formed and strong enough to push their way downward into the manure three or four weeks after planting. Mr. Harwood says: —

My object in these experiments was to ascertain what manures exercised an injurious influence on the germination of seeds, and, in the case of compound substances, to discover to which of their component parts their action was to be attributed. At the same time I hoped that the results might suggest some method of applying manures which would prevent the loss of plant so frequently accruing from their careless application; and that possibly the investigation might give rise to some satisfactory explanation of the destructive action of some of them on the seeds of beets and turnips, of which the Cirencester experiments last year gave such a striking example.

The experiments were made in wooden saucers of 4½ inches diameter, containing ordinary soil, to which water was supplied occasionally *quantum sufficit*. In the first series a quantity of each manure — about equivalent to one quarter of the bulk of the soil — was added, and 20 grains or seeds of barley and 20 seeds of turnips sown in each saucer. The arrangement and names of the manures experimented on were as follows: 1, no manure; 2, superphosphate of lime made from coprolite; 3, gypsum, to represent the sulphate of lime which constitutes about half the weight of superphosphate; 4, phosphate of soda, used as a source of phosphoric acid; 5, nitrate of soda; 6, common salt, or chloride of sodium; and 7, Peruvian guano. The seeds were sown on June 23d, and on July 6th the number that had sprouted were counted, the results being as follows: —

Name of Experiment.	Number of Seeds of Barley Germinated.	Number of Turnip Seeds Germinated.
1. No manure	17	A few.
2. Superphosphate	8	"
3. Gypsum	18	"
4. Phosphate of soda	None.	None.
5. Nitrate of soda	"	"
6. Common salt	"	"
7. Guano	"	"

It will be observed that all the manures except gypsum are found to be injurious, and the four last, phosphate of soda, nitrate of soda, common salt, and guano, entirely destructive to seeds when present in such large quantities as in these experiments. But the results thus obtained cannot be accepted as indicative of what would be the effect of the use of these manures in the field, unless it were in exceptional spots where the seed was allowed to fall in contact with them, as is sometimes seen on headlands where manure is spilt by the drill in getting out and in the work.

The conditions under which turnip and beet seeds are commonly grown, are much more nearly imitated by the arrangement of the following experiments. In this second series 20 seeds of turnip were sown on July 1st in soil similar to that employed in the former series, to which were added five grains of each of the same manures as in the first series, with the exception of common salt. This weight of 5 gr. represents about 4 cwt. per acre, and was distributed equally over the surface of the soil, sufficient water being occasionally supplied, as in the former series.

The following statement shows the number of seeds germinated on July 6th, the average length of their plumules or stems, and the total length of plumules in each experiment.

Second Series.	Number of Seeds Sprouted on July 6.	Average Length of Plumules.	Total Length of Plumules.
		Inches.	Inches.
No manure	12	1½	18
Superphosphate, 5 gr.	19	1¾	33
Gypsum, 5 gr.	20	1¾	35
Sulphate of ammonia, 5 gr.	13	None visible.	None visible.
Nitrate of soda, 5 gr.	5	¾	3
Guano, 5 gr.	8	None.	None.
Phosphate of soda, 5 gr.	17	1	17
1 drop of strong sulphuric acid	15	1	15

Here the character usually ascribed to superphosphate, of giving the seed a "start," is fully

justified, and this peculiarity appears to be a property possessed by all its constituent parts, and especially by gypsum or sulphate of lime. But perhaps the best indication of the influence of the manures is the rapidity of the growth of the germ; this was ascertained by measuring the plumules or stems of the young plant on the same day that the number of sprouted seeds was counted. The results so obtained are shown in the second column of the foregoing table, and in the third column is shown the total length in inches of the whole number of plumules in one experiment. In this manner the destructive nature of sulphate of ammonia, nitrate of soda, and guano — to which attention has been called by Professor Wrightson — is clearly illustrated; and although phosphate of soda and free sulphuric acid do not prevent the germination of the seeds — for about the same number sprouted of those exposed to their influence as of those unmanured — yet they appear to retard their after-development.

The results of these experiments support the conclusion arrived at by Professor Wrightson, that it is not advisable to allow nitrate of soda and guano to come in contact with the seed until the plants are up; and in an experiment I saw last summer, in which superphosphate was drilled with the seed, and nitrate of soda distributed afterwards, no injury was done to the seed, and a good crop was produced.

In these experiments I have noticed that the substances employed were injurious in proportion to their solubility, or nearly so. Thus, while nitrate of soda and sulphate of ammonia (both easily soluble manures), and guano (which contains a great deal of soluble salts of ammonia), were very injurious, gypsum, which is nearly insoluble, and superphosphate, which, it is believed, becomes so in a great measure on coming in contact with the soil, exert either a beneficial or neutral influence. Acting on this conclusion I arranged another series in which two fresh experiments were included — one on the use of sugar, to represent a readily soluble substance, devoid of powerful chemical action, and the other on the use of sand containing no saline matter, instead of the soil employed in the other experiments. To compare with these there were added an unmanured saucer, and one to which 5 grains of nitrate of soda were applied. The number of the 20 grains of barley sown which had germinated after the expiration of six days is shown in the following tabular statement: —

Third Series.	Number of Grains of Barley Germinated.
No manure	15
Nitrate of soda, 5 gr.	5
Sugar, 5 gr.	2
Sand instead of soil	20

It will be noticed that the barley grown in sand which contained the least soluble matter germinated most easily, every grain sprouting; that on the unmanured soil, as before, more readily than that manured with nitrate of soda, while the 5 gr. of sugar are shown to be very destructive, even more so than nitrate of soda.

These results, I think, show that the loss of plant in our fields from the use of manures is not due to their direct chemical action on the germ or embryo, but to some more indirect influence. It is well known that the oxygen of the atmosphere exerts a very powerful influence on seeds — that, in fact, in its absence germination cannot take place, for if seeds are covered with water, even a thin film, they will not grow, although their temperature were that most adapted to excite them to action.

Is it possible that manures in solution exert a similar influence, and that being absorbed by the seed, they form a film or case which prevents the access of oxygen to the embryo? I mention this theory merely as a suggestion, for our knowledge of the subject is not at present sufficient to warrant a more decisive statement; but this hypothesis appears to fully explain the results which I have mentioned, and I can see no objection to its acceptance.

MAKING AND PROTECTING LAWNS.

A VERY deep interest continues to be manifested by our readers respecting lawns; questions are often asked as regards how to make, and how to keep them green and luxuriant. It is quite easy to give instructions how to properly prepare the soil, sow the seed, etc., but how to maintain the sod in a beautiful and satisfactory condition is a difficult question to answer. If we had a climate like that of England, we could easily maintain lawns as rich and luxuriant as those we see around gentlemen's country residences, or in the public parks of England, but unfortunately we have not. This burning hot climate of ours is fatal to the highest success in landscape gardening; we cannot have, unless in exceptional years, greensward for more than about four or six weeks at most, in a season, and although we spend thousands of dollars in preparing our grounds, the hot sun and winds of July and August are pretty sure to burn everything almost to a crisp. This is very vexatious and discouraging, but we cannot change the forces of nature when absolutely against us, and so we submit. It is true, much can be done to fortify against droughts, especially those of ordinary seasons; but by no care or expenditures can we fully meet the evils resulting from deficient rains.

The present season in New England is an illustration of how delusive are all our hopes and expectations, and how impossible it is to avert the ruin produced by extraordinary and unseasonable drought. No rain, with the exception of trifling showers, has fallen since April, and we are writing on the 7th of June. The tender grass struggles with the overpowering heat, and the baked soil is hard and cracked. At a time when all succulent herbage needs plenty of moisture, this is withheld. The aspect of the vegetable world, just awakened from its long winter's sleep, is melancholy and discouraging to the horticulturist and farmer. How long this extraordinary drought is to continue no one can tell. Grass plats newly laid out at much expense in May are now nearly ruined, and lawns look brown and sombre. It is obvious that in such a climate no one can give advice which will serve to guide in the perfect preservation of lawns. In former numbers of the JOURNAL the subject of lawns has been considered, and we have but little that is important to add to the advice already given.

INSECTS.

THE destruction caused by insects upon fruits and cereal crops is of a most serious character. The ruin produced by the locust or grasshopper in some of the Western States awakens us to the appalling fact that this filthy, insignificant insect has the power, if its ravages were extended over the habitable globe, to cause universal famine; in short, it is capable of causing the destruction of the entire race. The potato-beetle has devastated thousands of acres of land, planted with a most important article of human food, and the canker-worm sweeps through orchards, consuming the foliage of the trees, and blighting the young fruit, so that scarcely a specimen reaches maturity. The currant-worm is active in his peculiar field, and if the shrub was universally neglected, the currant would soon cease to be known as one of our delicious fruits. The common tent caterpillar has this season been very abundant in the Northern States, but his ravages are preventable, and therefore we regard him with comparatively small dread. The best method we have devised to exterminate this pest is to take a strong solution of whale-oil soap, and with a brush affixed to a long pole saturate the nests in the morning when the inmates are usually "at home." About one pound of soap to three gallons of water is sufficient, and generally one application does the work.

Increased attention must be given by scientific men to the matter of practicable methods for the extermination of insects. With the increase of population and valuable cereal products, the pests more than keep pace, and unless some means are devised to stop their ravages, whole States will be depopulated.

NOTES AND MEMORANDA.

FARMING ON GENERAL PRINCIPLES. — The London *Agricultural Gazette*, in one of its leading articles, has the following apt remarks on this subject: —

"A young farmer cannot learn too early the important lesson that the profit or loss of particular acts of husbandry cannot be determined for him on general principles. He will, indeed, do well to remember the advice of a famous physician who, on entering a sick chamber, immediately ordered a blister to be put on the patient's head. A young doctor, an admirer of the master's skill, asked him what he had seen at a single glance to justify the blister. The reply was that a long lecture would be required to expound his reasons fully, since they were derived from the close observation of symptoms during a long experience. He added, in reference to his rapid insight, "The patient's eye had something to do with it; but it was not that alone, so don't go and blister the occiput every time you observe such an eye." This is an illustration of the errors which a man who farmed on general principles, with insufficient knowledge of details, would be certain to commit. And we would recommend a course of practical observations in the field by every agricultural student, in order that he may avoid such mistakes."

KEEPING APPLES OUT OF DOORS. — The *Rural Home* gives an account of an experiment near Rochester in keeping apples on the ground under leaves. Two bushels of leaves were placed on one bushel of apples, the whole being partly surrounded by evergreen trees, which kept the wind from blowing the leaves. They were found this spring less decayed than apples in the cellar, and fresh and fine in condition. There were obviously two or three causes which made them keep well. Contact with the earth gave them moderate and uniform heat from below; the leaves, being stratified, turned off the water and kept out the cold, the frost of very few winters ever reaching through a foot of leaves; and the evergreen trees gave additional protection. If we were covering apples in this way in an exposed situation, we should want a foot of leaves, held down by evergreen branches; but, surrounded closely by evergreen trees, half that depth of leaves might answer.

Boston Journal of Chemistry.

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☞ Communications and letters relating to matters connected with the editorial department of the JOURNAL should be addressed to the editor, Winnekeni Hall, Haverhill, Mass. Letters of business may be sent to the publishers, 125 Milk Street, Boston, as usual.

A NEW VOLUME.

WITH the commencement of a new volume, we enter upon the last year of the first decade since the establishment of the JOURNAL. Starting upon its career as it did with less than a hundred subscribers, it is certainly remarkable that in the short period of nine years it has secured the largest list of patrons of all journals of its class in the United States. Indeed, we doubt if any periodical devoted to abstract or popular science, published in any part of the world, has a bona fide, paying patronage so large as the JOURNAL. The best evidence of the high estimation in which it is held by its friends is the fact that during the past year, when nearly or quite all serial publications have suffered from a heavy withdrawal of patronage, the JOURNAL has not only maintained its ground, but considerably increased its circulation. A subscriber once secured has been rarely lost, unless by reason of death or some overpowering calamity. This statement is abundantly confirmed by the records of the business department of the paper. In this fact we find great encouragement and support, for it is certainly true that any journal which holds its patrons by weak or uncertain ties accomplishes no good end, and its conductors are not fitted for their posts.

Our aim has uniformly been to bring scientific facts and principles into practical connection with the every-day affairs of life, to make science respected among the masses, and to secure patronage and support for research. Also, we have endeavored to instruct the family, as well as to supply new and important information to men engaged in almost every department of professional duty. It is exceedingly difficult to meet these ends satisfactorily, but the assurances of success so often received from those whose judgment and good opinion we respect afford a measure of satisfaction for the past and encouragement for the future. The JOURNAL will continue on the even tenor of its way during the present year, without any essential modifications or changes.

AN EXTRAORDINARY EXPLOSION.

A FEW weeks ago an explosion occurred in the apothecary store of Mr. G. D. Dows, on Washington Street, this city, which in many of its aspects is the most remarkable on record. Mr. Dows is known as a prominent druggist, owning a large and well-conducted establishment on the most frequented thoroughfare in Boston. At about six o'clock P. M. a rumbling sound was heard in the building, and immediately the whole structure was lifted from its foundations and fell into a mass of ruins. The destruction was instantaneous and complete, the walls, timbers, and everything contained in the building tumbling into a huge pile of rubbish. So sudden was the catastrophe that none of the occupants could escape or even move from their positions, and they were buried in the ruins. Three were killed instantly, and several others were seriously wounded. The investigations made by the municipal authorities failed to show the cause of the explosion, and it remains to the present time a mystery. The testimony elicited before the coroner's jury was conclusive upon several important points, and hence numerous theories have been formed regarding the cause of the accident. A dozen witnesses concur in stating that there was a booming sound and a flash of light connected with the explosion, and this originated in the rear of the store and apparently in the cellar. Mr. Dows states that he had no explosive agents in his store, no gunpowder, nitro-glycerine, or dualine; and he thinks there could have been no leakage of street gas, as no odor was observed by any occupant of the building. There were soda-water fountains charged, in the basement, but no evidence is afforded that any of them exploded, and indeed if they had, they were incapable of producing the extensive mischief. Therefore no clue has been afforded in the searching investigations made, which satisfactorily clears up the mystery. Under this state of things we venture to make some statements which in our view are capable of affording light upon the subject. In the course of a laboratory experience extending over a period of more than a quarter of a century, a large number of explosions of every conceivable kind have been met with, and therefore the whole subject is practically familiar to us. We have experienced explosions which rent asunder the thick walls of our laboratory as if they had been of glass; and on several occasions have the windows been sent flying across the yard with a force which tore them into fragments. Three explosions of copper vessels charged at high pressure with carbonic acid gas have occurred in our presence, and the scars of the cuts made by the flying fragments of the vessel remain upon our limbs. Explosions caused by the fulminates of mercury and silver, iodide of ammonia, nitro-glycerine, etc., have also taken place while we were in dangerous proximity, indeed while the manipulating processes were under our hands; and yet life has been spared. In view of this practical experience, and with the facts connected with the explosion at Mr. Dows' store before us, it seems highly probable that the catastrophe was caused by the vapor of ether. Mr. Dows states that he had several bottles of this dangerous agent, holding five pounds each, in the rear of his store, or in the cellar, and the sudden breaking of any one of them by falling, or by pressure of the volatile liquid, would by the ignition of the air-mixed vapor be sufficient to produce the entire work of ruin. The vapor of ether, when mixed with atmospheric air in the proportions of one part of ether to six or eight of air, affords a very powerful and dangerous explosive agent. Of this we have had practical experience in the extensive manufacture of the agent. On one occasion, in 1859, by the leakage of a retort the air-mixed vapor travelled over a space of more than fifty feet in a few seconds of time, and coming in contact with the furnace fires, an explosion occurred which lifted the building from its foundation and levelled a brick wall of great strength even with the ground. There was a flash and a rumbling explosion in this instance, which corresponded with that on Washington Street, and the results, although not so disastrous, were of a most serious character. It is clear that ether in quantities as small as that stated by Mr. Dows to be present in the store is fully competent to cause the damage, and the highly volatile nature of the liquid causes the vapor to be almost instantly disseminated when free from the restraints of the containing bottle. At another time we will consider this matter further, hoping to obtain additional facts which will serve to fully clear up the mystery.

WHAT OUR FRIENDS SAY OF THE JOURNAL.

WE are not in the habit of printing the hundreds of friendly testimonials that the JOURNAL receives from the press and in private letters. It is only at rare intervals that we make this public acknowledgement of kind words and good wishes that ought not to pass without at least a brief expression of our appreciation and gratitude.

We give a very few of the most recent tributes of this kind taken at random from the letters on our table.

A professor in an Ohio college writes: "Thank you for publishing such a sensible and sound practical journal for everybody." A New Hampshire physician writes as follows: —

"I can but heartily concur with others, who say that they cannot get on well without the JOURNAL; for to myself it is an excellent text-book in the three great compartments connected with social life: agriculture, general science, and medicine, including chemistry and its relation to the healing art."

From distant Wisconsin another physician, who has taken the JOURNAL for several years, assures us that "it comes like an old friend," and that no periodical he receives "is, for the outlay of money, worth one half as much." A subscriber in Brooklyn, N. Y., says "it is worth five times what it costs." A lady in Indiana writes thus: —

"I have long desired a periodical devoted strictly to the science of *home life*, but had not found it until the JOURNAL accidentally fell into my hands a few weeks since. I am delighted with it; it is just the thing, and is so cheap as to come within the reach of almost any one."

A veteran subscriber in Western New York, who has been "a careful reader of the paper from No. 1, Vol. I., to the present time," adds, that he finds "no other journal so valuable and interesting."

The notices of the press are of the same complimentary character. The *Salem Gazette* says: "This is one of the best scientific journals in the country." The *Hingham* (Mass.) *Journal* of June 17th, 1875, remarks: —

"The JOURNAL is the best publication, of its kind, that we know of in this country. Even the most casual reader cannot glance over its pages without gaining some instruction of value, and to those versed in the weightier matters of which it gives a monthly *résumé*, it is particularly interesting. Although a non-professional, we freely acknowledge our indebtedness to this excellent publication for many valuable practical hints. . . . The paper is only a dollar a year, and it is worth ten times the amount."

The Boston *Commercial Bulletin*, of June 19th, just at hand, says: —

"The Boston Journal of Chemistry is so excellent a publication that we cannot resist directing attention to it. Not only is it interesting to practical chemists and pharmacists, but it treats of the arts of agriculture and medicine and the science of home life in a manner interesting to the general reader."

If our limits allowed, we might go on with these extracts indefinitely, but these few must suffice. We can only add that, in the future as in the past, it will be our aim to make the Journal more and more worthy of the good opinion of its friends and the generous patronage they have given it.

WINE WITHOUT GRAPES.

We never expected to see the manufacture of wine without the juice of the grape defended by any reputable authority; but this seems to have been done at a recent session of the International Viticultural Congress, at Montpelier, France. On that occasion M. Saint Pierre, a professor in the medical college of that city, gave some facts in regard to this fabrication of imitated wines, a branch of business which has of late rapidly developed in Hérault, especially at Cette and Mèze. The product of this manufacture is mostly exported, the bulk being sent to Russia, Denmark, Holland, England, and North and South America. Cette alone makes nearly 8,000,000 gallons per annum, worth about 15,000,000 francs, or $3,000,000. Two thirds of this is consumed in America. The only wines that can be successfully imitated are those rich in alcohol, such as the wines of Spain and Portugal. It is not true that grape-juice is the only thing omitted in the composition of these wines, as that is the cheapest ingredient. Nor is coloring matter used to any extent, as the wines to be imitated are white. The Portuguese formerly colored their wines with elder-berries, but abandoned it on finding that it injured the wine. The imitation of Spanish wines utilizes a large amount of cheap wines in the south of France, the production of which has been stimulated of late years. These wines show scarcely 11 per cent. of alcohol, but with the addition of syrup of mulberry and alcohol the strength is raised to 21 per cent. The professor, with great frankness, pleads for the encouragement of this industry. The members of the congress visited Cette and Mèze, and inspected several manufactories. One of the largest at Cette had then stored over 280,000 gallons in cellars containing from 80,000 to 100,000 gallons each. The total value of the whole deposit is stated at $200,000. At Mèze one establishment astonished the visitors by the vast extent of its cooper-shops, and its steam-engines of great power pumping the wine from great cisterns into the casks.

ON THE MEASUREMENT OF AIR-ANGLE.

ADDITIONAL NOTES.

Mr. Brooke's indorsement of Mr. Wenham's use of the triangle, as quoted in this journal for May current, has more significance than he probably intended or contemplated. It runs as follows: "Mr. Wenham is unquestionably right in stating that if an isosceles triangle be described, the base of which is ten times the measured diameter of the front lens and the altitude ten times the measured distance of the focal point from the same surface, the vertical angle of that triangle will correctly represent the *maximum available* aperture." (From the Annual Address of President Charles Brooke before the Royal Microscopical Society, London, February, 1875.)

In my article discussing angle measurement I limited the case to 170° in air. But the argument is easy from that to *infinitely near* 180°, and, when in fact inappreciably different from that, if at all, it practically *is* that angle, if only proven infinitely near. But the utmost breadth of pencil that can enter a plane surface of crown-glass (of index 1.525 very nearly) is narrowed to a cone of rather less than 82° within the body of the glass (or "balsam") necessarily and certainly, and is known as the *interior* or "balsam" angle. The exterior angle can always be known from the interior, and *vice versa*, and according to familiar law. All balsam mounts are known to be limited to this *interior* cone for their greatest obliquity of illumination of the object. This in practice is so universal that nowhere has more than this 82° of interior illuminating pencil been even *suggested* as possibly available by the objective, until within five years, and is even now heard of in the high quarters only with the utmost impatience of attention, and with *no* toleration.

However, as this Brooke-Wenham rule of the triangle, by its terms and also from the nature of the proposition itself, applies for the measure of "balsam" or interior angle exactly as for that of a dry mount or air-angle (of a certainty this will not be denied), therefore let us see how runs the application.

Here are the data according to Mr. Wenham. Diameter of front lens, 0.043 of an inch. Focal distance in "balsam" (through glass cover to the object in balsam), 0.018 of an inch.[1] The objective as adjusted when measured for angle in London, as also here, was (by its construction) corrected for thickest cover, and therefore this focus of 0.018 is a *corrected* focus, and it follows that if the diameter is correctly given, the vertical angle of this triangle, derived from diameter and "median height," would be the measure of the angle in "balsam," viz., 88°. Thus, according to Mr. Brooke, Mr. Wenham's doctrine and measurements of the triangle combine to prove 88° of *balsam* angle in this very $\frac{1}{8}$ objective. But 82° of balsam angle represents 180° of air-angle, confessedly. *Thus, again, his own rule legitimately applied, according to Mr. President Brooke, establishes the fact of a maximum air-angle for the* $\frac{1}{8}$, which as *measured* for angle by Mr. Wenham was made to seem to have only 112°. Full angle proven and "balsam" angle to spare, — six degrees surplusage!

HOW TO USE THE SURPLUS.

Although this objective (according to my own measurements) has the *capacity* to transmit to the eye an angular pencil of 98° from an object in balsam, under glass cover, on the ordinary glass slide, still, as the lower exterior plane surface of the slide cannot transmit more than 180° of exterior pencil, that as already stated limits the illuminating pencil to 82°. These additional 16° of interior pencil thus cut off from access to the object can be rendered available only by in some way *cancelling* that first, lower surface in the path of the light. This can be done in several ways. The most obvious is the use of a plano-convex lens, with water, *glycerine*, or balsam contact to the slide; otherwise, a semi-cylinder, preferably with facets, plane, at various obliquities, worked or placed on the cylindrical surface. For this case of 98° interior angle, the facet of most obliquity would be only 48° from the axis (with a *dry* object, of course, light beyond 41° would be of no avail, — field in darkness). Also for the same purpose an immersion objective of suitable angle can be used under the stage as a condenser. Anything to cancel the lower surface of the slide effects the purpose, *i. e.*, gives passage of these *ultra* rays into the glass.

To be sure, when we talk of more than 82° of interior angle the *corresponding* exterior ray is above the plane of the slide, or of face of objective, or if you please *above* the stage! And this too is exactly accordant with experience, for during years now, I have practised the resolution of difficult diatoms in balsam by cancelling the *upper* surface of the slide, and thus effecting the utilization of these ultra-limital rays. In this case the light entering the slide from above and impinging directly (without refraction) upon the lower interior surface of the slide at a greater obliquity to the axis than 41 (but *within* the *interior* range of the objective-aperture) obviously would be totally reflected back from the lower surface (second and interior surface) of the slide at the *same* obliquity, and, traversing the object, be transmitted by the objective to the eye.

This narrow pencil of 8°, yea 4°, and even less, has done the work. In the case of resolution with light entering from above, all light of less obliquity to axis than 41° would *pass through* the slide, emerging at the lower surface. The pencil thus lost, or dismissed, is the *whole* pencil that any dry objective can transmit. Thus there is proof of the efficient use of the ultra-limital rays *alone*, by exclusion of all others.

The work to be done is to well correct even more than these extra increments of aperture already made well available. R. B. Tolles.

Boston, *May* 12, 1875.

[1] *Monthly Microscopical Journal*, for May, 1875, p. 225.

EDITORIAL NOTES.

A Remarkable Work of Art. — Some thirty or more years ago, Herr Ernst von Bandel, a Westphalian nobleman with a taste for the sculptor's art, conceived the patriotic idea of erecting a gigantic statue to Hermann, the vanquisher of Varus in the Teutoburg Forest. A grand national monument, the statue was to reach the enormous proportions of 100 feet, not to speak of pedestal and base; and as it was to be placed on the top of a hill, the site of victory, the difficulty of getting it in position not a little added to the magnitude of the undertaking. In spite of all obstacles, what appeared a chimera thirty years ago has now become a reality. Assisted by wealthy friends and occasional public subscriptions, Herr von Bandel has completed the figure, and in two months expects to witness the solemn inauguration of his monument by the German Emperor. The statue is of embossed copper, and has been wrought by the hand of the man whose brain created it. His whole life has been consumed in this one object. When he had done modelling — no small task in the case of a figure with hands 5 feet long — he took to the hammer and forge, and literally formed the immense surface with his own unaided strength. A good deal of it was done at the foot of the hill whereon it stands, the sculptor having built himself a forge and a hut close to his chosen locality. To judge from the head, which was exhibited ten years since, Germany will possess not only the largest but also one of the best statues in Europe. This eighth wonder of the world will tower over the famous oak woods near Detmold, the capital of the principality of Lippe.

An Improved Hotel Annunciator. — Our readers are familiar with the ordinary "annunciator" used in hotels to show the number of a room from which a bell has been rung. The best forms of the apparatus are worked by electrical agency, and M. Debrayeux, in France, has just invented an improvement by which the object of the ringing is indicated. The contrivance is commended by Count du Moncel in the *Bulletin de la Société d'Encouragement* for May. The arrangement is quite simple. Under each number of the indicator there is a board

with a list of the more common requirements in hotels, and an index-needle, moving up and down, stops at the proper one; at the same time a bell rings till the domestic comes and restores the needle to its starting-point. In the transmitter there is a corresponding table of requirements, with an index-needle, which is moved by means of a small metallic button. The person ordering has merely to push the index to the particular order he wishes to give, and by this movement he effects an interruption of the current, producing the number of emissions and interruptions necessary for the signal. Afterwards he brings the needle back to its initial position again, but this, the count remarks, might be done automatically.

The Manufacture of Phosphorus. — According to the *Polytechnisches Centralblatt*, the present supply of phosphorus comes from only two manufactories: that of Allright and Wilson, of Oldbury, near Birmingham; and that of Coignet and Sons, at Lyons. M. Pauli, who formerly made it at Strasbourg, and later at Carlsruhe, has given up the business, and no phosphorus is now made in Germany. Austria formerly had some manufactories, but these also are now abandoned. It is said that this is owing to the cost of the raw material; but it would seem that this ought to affect all European manufacturers alike, and that it would simply lead to a higher price for the product.

Leonardo da Vinci as a Scientific Man and Inventor. — At a time when aerial navigation occupies so much attention, it may interest some to be informed that Leonardo da Vinci, who was not only a great painter, but an able engineer (perhaps the first truly worthy of that name), observed long and carefully the flight of birds, with a view to discovering the laws which govern it. His knowledge of the anatomy of birds was very complete. In the *Technologiste* for April may be seen a design of his, representing a sort of artificial wing, with fingers, on which cords, taking the place of muscles, impress proper movements, independent of the general movement of the whole apparatus. The invention of the parachute, which was first attributed to Montgolfier, and later to Le Normand, is really due to Leonardo da Vinci, three centuries before them.

Another New Notion in Cremation. — Dr. Bernays, Professor of Chemistry in St. Thomas's Hospital, London, suggests that by a proper application of mother earth, humation might be made as safe as cremation. Instead of cremating the body, he would cremate the *earth*, and render it, by increased porosity, the best material for slowly, but surely and safely, oxidizing the body. Thus alone could the clay soils of many of our cemeteries be made properly available for burials, and without such burning of the soil some of our cemeteries ought not to be used. Dr. Bernays suggests coffins of perforated iron plate, with lids of the same material. These should be covered to a depth of 1 ft. with charcoal, and completely filled in with well-burnt clay. By such a method advantage would be taken of one of the most valuable properties of burnt clay — the power of absorbing and oxidizing injurious hydrogenous compounds, and promoting decomposition. One great advantage of coffins of sheet iron, thus perforated, would be the rapid oxidation of the receptacle of the body, which, by the color of the oxide, would render all the drainage water from a cemetery visible for some distance from its source, and thus give the necessary indications of impurity.

ATOMS.

By the use of the telegraph we are enabled to answer Job (xxxviii. 35) in the affirmative, who 2000 years ago asked, "Canst thou send lightnings, that they may go and say unto thee, Here we are!" — Professor Abel, in a recent lecture at the Royal Institution, London, gave some instances of the recklessness of miners in the use of explosives: they have been known to open a gunpowder barrel with a crowbar or a stone, or even with a red-hot poker; dynamite is apt to freeze, and is taken to bed overnight by the workman who is to use it in the morning, or put into the oven while he eats his breakfast! — According to a French scientific journal, a captain in the French army, who had always experienced headache, vertigo, and pains in the stomach after smoking, has discovered that by mixing a few dried leaves of *Eucalyptus Globulus* with his tobacco all these effects are prevented. — A new town in the California quicksilver region has been named Mercury. — An excellent bronze for small castings may be made by fusing together 95 parts of copper by weight and 36 parts of tin. — A French medical man reports to the Academy a case in which he has succeeded in curing grave congestion of the brain, along with paralysis of the whole right side, by making the patient inhale pure oxygen; from the first inhalation the patient got relief, and motion and sensibility returned by degrees. — The railway up the Righi in Switzerland pays so well that another line has been built, starting from Arth, on Lake Zug, on the other side of the mountain. — An English journal says that the cows on the island of Ushant, off the coast of Brittany, feed principally on sea-weed, and that consequently their milk is particularly rich in iodine; and it is proposed that this milk be used for the cure of diseases benefited by iodine, as it does not produce the constitutional disturbances that often result from the administration of iodine in other forms. — Apropos of iodized milk, an Italian physician, fifteen years ago, proposed to obtain it by feeding cows on hay that had been sprinkled with a solution of iodide of potassium. — Dr. Sandwith, at a sanitary meeting in London, remarked that he saw no hope of pure water for the metropolis "until the vicious circle of the water-closet, the river, and the mouth was broken." — Whether oats will change into wheat, or barley into rye, are questions which the agricultural journals in England are again seriously discussing; and there is no lack of evidence from honest people that they have "seen" the metamorphosis, or thought they did! — About 300 agricultural laborers left Boston the other day for New Zealand (but it was Boston in England, not New England), and as many more were to start a week or two later. — A physician in Indiana has reported a case of "spazzams." — English papers state that Mr. Hart Dyke, the "Conservative whip" of the House of Commons, has been laid up for some time from a sharp attack of inflammation and painful blistering of both feet, caused by wearing some new socks with bright red stripes; from which it would appear that the use of poisonous dyes has not yet been abandoned in England. — The recent examination in botany at Harvard College might have been taken by a casual visitor for a floral exhibition, the room being gay and fragrant with heaps of flowers provided for practical work in analysis on the occasion. — A recent explosion at Woolwich shows that moist gun-cotton, instead of being perfectly safe, is liable to explode when forcibly pressed into a confined space, as in a shell. — According to a recent estimate there are now 50,000 miles of submarine telegraph cables in working order, and 20,000 miles (belonging to 58 different cables) that have become useless. — Signor Tommasi, in the *Comptes Rendus*, announces the interesting discovery that when a current of steam, subject to a pressure of 5 to 6 atmospheres, is passed through a copper tube measuring 2 to 3 millimetres in diameter, and covered with a helix around an iron cylinder, the cylinder becomes magnetized so that an iron needle situated some centimetres distant is energetically attracted, and remains magnetized during the whole time of the steam-current's passage through the copper tube. — A good cheap paint for floors is made of five pounds of French ochre, one quarter of a pound of glue, and a gallon of hot water; when well dried, apply one or two coats of linseed-oil. — A "nose machine" is advertised in *Nature* and other English journals, described as "a contrivance which, applied to the nose for an hour daily, so directs the soft cartilage of which the member consists, that an ill-formed nose is quickly shaped to perfection," and the operation is said to be painless. — M. Félix Plateau, one of the best living authorities on the science of color, is entirely blind.

LITERARY NOTES.

Mr. H. C. Lea, of Philadelphia, has reprinted Dr. T. K. Chambers's *Manual of Diet in Health and Disease*, recently published in England. It is essentially a practical book, and is divided into three parts, devoted respectively to general dietetics, and the special dietetics of health and of sickness. Under the second head there are valuable directions for the regimen of infancy, childhood, youth, and the varied forms and phases of maturer life, including some excellent "hints for healthy travellers," suggestions as to "athletic training," etc. In the third part, the diet suited to various diseases is considered, with many recipes for appropriate dishes, beverages, and the like. The book supplies a want in medical literature, and in an eminently satisfactory manner.

Another dietetic manual, but of a more familiar type, is Marion Harland's *Breakfast, Luncheon, and Tea* (Scribner, Armstrong, & Co.), a sequel to, and not a substitute for, her "Common Sense in the Household," which the common sense of the people has indorsed as worthy of its title by a demand for repeated large editions. This new book is in all respects as good of its kind, and is already as eagerly sought for by sensible and thrifty housekeepers.

What and How to Read, by G. A. F. Van Rhyn (Appletons), is a guide to recent English literature, containing a minutely classified list of the best books published on both sides of the Atlantic during the past five years, with their prices. We have tested it by referring to the heads most familiar to us, and find it in the main very complete and accurate. The occasional "critical remarks" do not, in our humble opinion, add to the value of the book, but as a classified catalogue of recent literature it will be found very convenient.

Mr. E. C. Gardner has followed his "Homes and How to Make Them" with another sensible and sprightly book on domestic architecture, entitled *Illustrated Homes* (Osgood & Co.), or, as he further defines it, "a series of papers describing real homes and real people." It describes and illustrates a baker's dozen of dwelling-houses, of all grades, from a five-hundred-dollar cottage up to a first-class mansion with "all the modern improvements;" and all are uncommonly well suited to the wants of their owners. The illustrations are in heliotype, but not of uniform quality.

The Maritime Provinces is the third of Osgood's handbooks of American travel, covering Canada, Nova Scotia, Newfoundland, and the rest of that section, both mainland and islands, with maps and plans. It is modelled on Baedeker's plan, and it is no slight praise to say that it will not suffer from comparison with its foreign prototypes.

Europe for $2 a Day (Osgood & Co.) is a little 25-cent book by Mr. Sweetser, the editor of the guide-books just mentioned, containing many practical hints for impecunious tourists.

An Idyl of Work, by Lucy Larcom (Osgood & Co.), is a poem of mill-girl life, the scene being laid in Lowell, where the author was an operative in the days of "The Lowell Offering" — a period which, though only thirty years past, seems as remote from the present state of things in "the American Manchester" as the life of our Puritan ancestors from that of their "Centennial" descendants nowadays. It is interesting as an attempt to describe an obsolete (more 's the pity!) phase of industrial life, even if we do not accord it an exalted position as a poem. Blank verse is not the author's *forte*, though she has written some graceful lyrics.

An enlarged edition of *Boston Illustrated* (Osgood & Co.) contains many new views, and gives a good idea of architectural work accomplished since the great fire in all parts of the city.

The *Elements of Geometry*, by Professor C. S. Venable, of the University of Virginia, is the handsomest text-book of its class that we have ever seen, and the editor's work appears to have been very ably and successfully done. An excellent feature is the "geometrical exercises;" and the hints for the solution of the same will save them from being wholly neglected in class work, as such exercises usually are.

The American Artisan, published by Messrs. Brown & Allen, 258 Broadway, New York, is admirably edited, and no one who avails himself of our clubbing terms to secure it *with the* Journal for $2.50 a year will regret the investment. Though largely devoted to mechanical matters, as its title indicates, it gives a fair share of attention to popular science in all its branches, and is always copiously and handsomely illustrated.

The *Boston Medical and Surgical Journal* continues to improve under its new management, and physicians who have not been acquainted with it since it passed into the hands of Messrs. H. O. Houghton & Co. as publishers, will do well to send to them for a specimen number.

Medicine and Pharmacy.

ALCOHOL: ITS ACTION AND USES.

III.

In his fourth lecture, Dr. Richardson discussed the question, Is Alcohol Food? To this various answers have been given by scientific men, but he considers the evidence to be conclusive that alcohol is *not* a food in any degree or in any sense.

It is not the builder of any tissue whatever, probably not even of fatty tissue. This conclusion will surprise many who have noticed how ale fattens people; but this fattening is the result not of the alcohol but of the sugar or starchy matter which is taken along with it, and it would appear that drinkers of pure spirit, that is, spirit unmixed with sugar, do not fatten upon it. It may be added that alcohol induces desire for undue sleep, or at least for physical repose. This interferes with the ordinary nutritive processes. The waste products of the body are imperfectly eliminated, respiration becomes slower, and a series of changes begins, leading, independently of the direct action of the alcohol, to the deposition of fatty tissue. There is no evidence of the origin of fatty matter directly from the alcohol.

There is no doubt that alcohol is decomposed in the body, that it is assimilated in some manner. Careful and long continued investigations have been made by many scientific men on this subject. The late Dr. Anstie, especially, made a series of exhaustive experiments which led him to the conclusion that of the alcohol administered but a very small fraction was yielded by all the secretions combined. He proved that a terrier dog, weighing ten pounds, could take with comparative impunity nearly 2000 grains of absolute alcohol in ten days, and that on the last day of his regimen he only eliminated by all the channels of excretion 1.13 grains of alcohol. This fact was of itself sufficiently remarkable, but another still more important remains to be told. After an animal had been treated with alcohol, as above described, Anstie killed it, instantly and painlessly, two hours after it had received the last quantity — 95 grains — of spirit. Then the whole body, including every fragment of tissue with all the fluid and solid contents, was subjected to analysis, with the result of discovering only 23.66 grains of spirit.

Alcohol, it thus appears, is decomposed in the animal body. By its decomposition in air, heat and power may be obtained, and why not then in the other case? Direct knowledge gained from individual experiment shows that alcohol reduces the temperature of the body. As a result of these researches, four progressive stages of change of animal function from alcohol are recognized. These stages are developed in all the warm-blooded animals, and the changes of temperature throughout the whole are relatively the same.

In the first stage the external temperature of the body is raised. In birds, as pigeons, the rise may amount to a full degree on Fahrenheit's scale; in mammals it rarely exceeds half a degree. In man it may rise to half a degree, and in the confirmed inebriate it has been known to run up to a degree and a half. The heat felt in this stage might be considered as due to the combustion of the alcohol; it is not so, being in truth a process of cooling, owing to the more rapid radiation of heat from the larger surface of warm blood in the vessels partly paralyzed by the alcohol.

In the second stage the temperature first comes down to its natural standard, and then declines below what is natural. In birds the fall is from one and a half to two degrees; in other animals, as dogs and guinea-pigs, it rarely exceeds one degree; in man it is confined to three fourths of a degree.

During the third stage the fall of temperature rapidly increases, and as the fourth is approached it reaches a decline that becomes actually dangerous. In birds the reduction may be five degrees and a half, and in other animals three. In man it is often from two and a half to three degrees. There is always during this stage a profound sleep or coma, and while this lasts the temperature continues reduced.

Dr. Richardson said that the inference from all these facts is that the alcohol is not burned after the manner of a food which supports animal combustion, but that it is decomposed into secondary products by oxidation, at the expense of the oxygen which ought to be applied to the natural heating of the body. He supported these conclusions respecting the action of alcohol on the animal temperature by another series of observations, in which the effect of this substance on the muscular power was traced. He showed that the excitability of muscle was reduced just in the same way as the animal heat, until finally, as the spirit brings on narcotism, so is the muscular power brought down to a state of extreme prostration. "Indeed, if we were to treat our domestic animals with this agent in the same manner that we treat ourselves, we should soon have none that were tameable, none that were workable, and none that were edible."

The lecture closed with a few "hygienic considerations," which we cannot do better than to give in Dr. Richardson's own words: —

The facts I have endeavored to lay before you in this as well as in the last lecture, will suggest to your minds many thoughts bearing upon the health of individuals and communities in so far as health is affected by the potent agent, alcohol. I am bound to intimate that the popular idea of administering alcohol for the purpose of sustaining the animal warmth is an entire and dangerous error, and that when it is brought into practice during extremely cold weather it is calculated to lead even to fatal consequences, from the readiness with which it permits the blood to become congested in the vital organs. Whenever we see a person disposed to meet the effects of cold by strong drink it is our duty to endeavor to check that effort, and whenever we see an unfortunate person under the influence of alcohol it is our duty to suggest warmth as the best means for his recovery.

Whatever good can come from alcohol, or whatever evil, it is all included in that primary physiological and luxurious action of the agent upon the nervous supply of the circulation to which I have endeavored so earnestly to direct your minds. If it be really a luxury for the heart to be lifted up by alcohol; for the blood to course more swiftly through the brain; for the thoughts to flow more vehemently; for words to come more fluently; for emotions to rise ecstatically, and for life to rush on beyond the rate set by nature; then, those who enjoy the luxury must enjoy it — with the consequences.

ETHER AND CHLOROFORM AS ANÆSTHETICS.

The "Boston notion" that ether is to be preferred to chloroform as the safer agent for anæsthetical purposes is confirmed by a recent communication made to the *Società Medico-fisica*, of Florence, by Professor Schiff, abstracts of which we find in recent foreign journals. The paper embodies the results of more than five thousand experiments made by its author in order to ascertain the differences in the anæsthesia produced by these two agents. In the following points the two anæsthetics agree: they produce paralysis of conscious sensation, paralysis of the movement of the voluntary muscles, paralysis of respiration, of circulation, and, finally, of the heart and vasomotor nerves. The chief differences occur in the order in which the paralysis takes place. With ether, respiratory paralysis takes place while circulation and blood pressure remain within the limits compatible with life. In other words, respiratory paralysis precedes vascular paralysis in the case of ether, so that the vascular pressure remains sufficiently high, directly after respiration has ceased, to enable artificial respiration to be resorted to with success; or, in the words of the professor, "when some automatic respiratory movements have been obtained, it may be taken as certain that respiration will continue, and that the animal will live." With chloroform, on the contrary, vascular paralysis frequently comes on first, so that an amount of this agent which would be insufficient to produce respiratory paralysis will often bring on vascular paralysis, accompanied by such a lowering in the blood pressure as to render artificial respiration of no avail, as no interchange takes place between the gases of the air and those of the blood. Hence, although automatic respiratory movements may be induced, life is not recalled, and respiration again ceases when artificial aid is removed. In the present state of our knowledge, it may therefore be said that the surgeon is responsible for the death of an individual by etherization, while he is not so if chloroform has been used. Therefore chloroform should be rejected, and only ether used.

AN AMERICAN INSTANCE OF CREMATION.

Professor D. W. Yandell, in his late valedictory address to the medical graduates at Louisville, Ky., published in the April number of the *American Practitioner*, makes the following interesting contribution to the literature of cremation: —

"The only instance of cremation in this country of which I have any knowledge occurred many years ago, and in the person of a noted citizen. . . .

"Henry Laurens was one of the wealthiest merchants of Charleston. When the revolutionary struggle commenced he was in Europe superintending the education of one of his sons. He immediately returned home, threw himself with great vigor into the contest, was one of the foremost patriots of South Carolina, and enjoyed the unbounded confidence of Washington. He was elected a delegate to the Congress of 1776, and was chosen president of that body. In 1779 he was sent as minister plenipotentiary to Holland; but, having been captured by a British vessel, was confined in the Tower of London for fourteen months. The British authorities made him many offers to abandon the cause of his country, but they were all spurned. Soon after his release Congress appointed him one of the commissioners to make a treaty of peace with Great Britain, and in

1782, in conjunction with Franklin and Jay, he signed the preliminaries of the treaty.

"It is known that the distinguished South Carolinian made a will which contained the most positive commands for the burning of his body. The reason for this strange order is not generally understood. Laurens had a daughter, one of the loveliest of the girls of South Carolina. When about fifteen years of age she apparently died, and was shrouded and placed in a coffin for burial. The coffin was open, and lay in a room fronting the bay. A number of her friends, young ladies and gentlemen, were sitting as watchers of the corpse. As one of the ladies walked near the coffin she was startled by a slight movement of the body, and her actions drew the other watchers to the coffin. They were soon convinced that Miss Laurens was alive. The family were summoned and prompt measures taken for her resuscitation, which were successful. She afterward married Dr. David Ramsey, the patriot and historian, and an eminent physician of Charleston. Laurens never forgot the scene in his house connected with the narrow escape of his daughter from being buried alive. In prescribing cremation for his body, and in directing disinheritance for disobedience of this order, he declared that he could conceive of nothing more terrible than resuscitation in a closed grave. His body was burned in accordance with the injunctions of his will."

FASHION IN MEDICINE.

Prof. Dongan Clark, in an address to the graduates of the Indiana Medical College, has the following apt remarks on this subject: —

"Thirty years ago the lancet was used in perhaps nine cases out of every ten visited by the physician. To an equal proportion some preparation of mercury was administered. Now, I apprehend that the ratio is reversed, and that the physicians bleed and mercurialize no more than one in ten of their patients. Most of them, indeed, allow their bloodletting instruments to remain at home altogether, and grow rusty in total neglect. The human system will bear very considerable losses of blood with impunity, and I do not presume to criticise with any severity the proceedings of our immediate forefathers in the profession. Very few persons were actually bled to death by physicians, even in the days when phlebotomy was most prevalent; yet it can scarcely be otherwise than true that more harm than good resulted from this indiscriminate depletion. A patient in Philadelphia was very ill of pneumonia; he was subjected to repeated and large venesections, and after several days the physician reported that he was cured of pneumonia, but was dead of debility. Whether death of debility is easier and better than death by pneumonia, I am not prepared to say. In our day, as already intimated, the lancet has fallen into almost total disuse. It may well be questioned whether, at the present time, the reaction against blood-letting is not too strong, and whether we are not allowing our patients to suffer from the too unfrequent, as they formerly suffered from the too frequent and excessive, employment of the lancet. As regards mercury, there can be no doubt that the generation of physicians immediately preceding our own employed it in excessive quantities, and sometimes to the injury of their patients. The injuries so produced have inspired the public mind with a prejudice against the drug; a prejudice so strong, indeed, that many patients now will steadfastly resist its administration even in cases where it would do them immense benefit. Mercury, like alcohol, has undoubtedly its legitimate use as well as its abuse; and every one of you has met with cases in which it could not be effectually substituted by any other drug in the pharmacopœia. Yet of an equal number of persons who have taken calomel and lobelia respectively, a much greater proportion have perished from the latter drug than the former. If one has slain its thousands, the other has slain its tens of thousands. In hundreds of homes in Indiana lobelia is kept as a domestic remedy, and administered, without fear and without the advice of a physician, by good mothers to their sick children; while the same mothers would dread to administer a dose of calomel, even by a physician's direction, as they would dread a serpent's bite."

ELECTRO-CAPILLARY FORCES IN ANIMALS AND PLANTS.

In a paper which appears in the *Comptes Rendus*, M. Becquerel treats of the action of electro-capillary forces in the organic world. He considers these forces more important than any others concerned in the functions of organic life. In order to produce them, nothing more is required than permeable tissues separating two liquids of different natures, which find in the organism the conditions necessary for their production. Arterial blood, leaving the left auricle of the heart, before becoming venous blood traverses capillary vessels which bring it in contact with muscles covered with exuded liquids. Electro-capillary actions are thus excited, subserving their nutrition and growth. In a series of experiments, arterial and venous blood were brought into contact with various liquids, such as bile, urine, wine, grape-juice, and sugar solution charged with carbonic acid, and both were found negative in relation to the liquids; and it may be supposed that the same thing occurs when arterial blood in the capillaries comes in contact with the liquid exuded by muscles. The direction of the electro-capillary currents is such that the interior walls of the capillaries are positive electrodes, and their exterior walls negative electrodes. There is thus oxidation in the interior of the capillaries, and reduction on the side of the muscles. The interior of a muscle is usually negative in relation to the fluids that moisten its external surface; the electro-capillary currents proceed from the inside outwards, and this direction gives oxidation within and reduction without.

In fruits, as grapes, apples, and pears, and in roots, as potatoes, carrots, and turnips, there are similar electro-capillary currents. In contact with water, the interior parts are constantly found to be positive. Thus, when fruits are moistened, their interior layers next to the external tissues tend to ceaseless oxidation. Salt water produces opposite effects.

Before electro-capillary currents were known, it was supposed that in transmitting an electric current, for medical purposes, into the interior of an organized body, no electro-chemical action would ensue unless solid bodies, such as wires, conducted the electricity, and served as electrodes. Now, however, it is known that an infinitely thin layer of liquid adhering to the walls of a permeable tissue behaves like a metallic film in electro-chemical decompositions. We may conceive such actions taking place in organisms, and producing very complicated results.

THERAPEUTICAL MEMORANDA.

Treatment of Typhoid Fever. — Dr. George Johnson, in the London *Practitioner*, takes the ground that in the treatment of typhoid fever careful nursing and feeding are of primary importance, while, as a rule, no medicines of any kind are required, and when not required they are often worse than useless. Diarrhœa is a less frequent symptom than before this plan was adopted, and when it does occur it is far more tractable, while tympanitic distension of the abdomen is a rare event. The mischievous opiate enemata and the torturing turpentine stupes have disappeared together. He believes that one of the main reasons why there is less diarrhœa than formerly is the careful abstinence from the employment of irritating drugs of all kinds. As a rule, a fever patient at "King's" has the "yellow mixture," which is simply colored water; and, except an occasional dose of chloral to procure sleep, and a tonic during convalescence, no active medicines of any kind. These patients are fed mainly with milk, with the addition of beef-tea and two raw eggs in the twenty-four hours, and wine or brandy in quantities varying according to the urgency of the symptoms of exhaustion, especially in the advanced stages of the disease; but in many of the milder cases, and especially in the case of children, no alcoholic stimulants are required from the beginning to the end of the fever, and when not required they are of course, says Dr. Johnson, best withheld. He gives no irritating drugs of any kind, and has no doubt that the comparative infrequency of severe and obstinate diarrhœa amongst his enteric fever patients during the last few years is partly attributable to the discontinuance of mineral acid treatment.

The Treatment of Diarrhœa. — In a paper in Virchow's *Archiv*, Dr. Hartsen observes that diarrhœa of all sorts goes along with an irritable state of the intestinal canal, and any increase of this irritability is to be carefully avoided. He considers that the more usual astringents are, in addition, irritants; and he instances among them the salts of lead, zinc, and bismuth. In all cases, soothing means should first be adopted; and of these, warm applications to the abdomen, in the form of bread poultices, or fomentations, are perhaps the best. The chief medicine recommended is opium, which soothes, but, in large doses, interferes with digestion. If the diarrhœa be so violent as to hinder the absorption of opium introduced into the stomach, then morphia should be injected subcutaneously. Of equal importance is the diet. If the person be strong, everything, both solid and fluid, should be withheld; but, where this cannot be done, the food should be of the lightest and simplest. The author especially refers to rice and arrowroot as simple vegetable diets, while any animal food given should be free from fat. Milk should not be too much used, and in any case should be boiled.

Tar in Bronchial Catarrh and Winter Cough. — In a note sent to the *British Medical Journal*, Drs. Sidney Ringer and Wm. Murrill state that in the treatment of these complaints they have employed tar in two-grain doses, made into a pill, every three or four hours. From October to January, inclusive, its effects were watched on twenty-five patients, whose ages varied from thirty-four to seventy. All these patients had suffered several years from winter cough during the whole winter.

Each attack of the paroxysmal and violent cough lasted from two to ten minutes, recurring ten or twelve times in the day and breaking their rest at night. Expectoration was abundant, frothy, and purulent. Breathing was short on exertion, but most could lie down at night without propping. The physical signs showed a variable amount of emphysema, with sonorous and sibilant rhonchus, and occasionally a little bubbling rhonchus at the base. These patients usually began to improve from the fourth to the seventh day; the improvement rapidly increased, and in about three weeks they were well enough to be discharged. The improvement was so decided that even those patients who, in previous years, had been confined to the house during the whole winter, returned to their work. On discontinuing the tar, relapses often occurred in a week or two, but on readministering the medicine relief was again obtained.

Bromide of Potassium in Whooping-Cough. — Dr. W. Smith, in the *British Medical Journal*, says: There is at present a generally diffused

epidemic of whooping-cough, and I think it may be useful to suggest a remedy which I have found beneficial — bromide of potassium. It allays the violence of the paroxysms, and cures in a few weeks, sometimes less. I generally combine it with the bicarbonate, and with tincture of hyoscyamus in camphor mixture.

Bicarbonate of Soda in Toothache. — Dr. Dyce Duckworth contributes a short memorandum on this subject to the London *Practitioner* for April. He was called on to treat a case of very severe toothache, and tried various ordinary remedies, including chloroform and carbolic acid, without any benefit to the patient. He then remembered having read that the pain might be relieved by holding in the mouth a solution of bicarbonate of soda. He at once gave the patient half a drachm in an ounce of water, and, to his astonishment, the pain ceased immediately, and complete relief was secured. He thinks that, as the remedy is so simple and the disease so distressing and often intractable, this treatment may be worthy of notice and of imitation.

HOME AND FOREIGN NOTES.

A Common Cause of Apoplexy. — In an able article on apoplexy, in the *Popular Science Monthly*, Dr. J. R. Black gives the following hint to brain-workers :—

"A middle-aged physician said one day to the writer: 'As I was walking down the street after dinner I felt a shock in the back of my head, as if some one had struck me; I have not felt well since. I fear I shall die, just as all my ancestors have, of paralysis. What shall I do?' The answer was, 'Diminish the tension on the blood-vessels, and there need be no fear of tearing them in a weak place.' Now this expresses in plain terms the exact cause of apoplexy in the great majority of instances; and it is one, too, which every one has it in his power to prevent. A blood-vessel of the brain has lost some of its elastic strength; food is plenty, digestion is good; blood is made in abundance, but little is worked off by exercise; the tension on every artery and vein is at a maximum rate; the even, circuitous flow is temporarily impeded at some point, throwing a dangerous pressure on another; the vessel which has lost its elastic strength gives way, blood is poured out, a clot is formed which, by its pressure on the brain, produces complete unconsciousness. This is the apoplectic stroke. It will be perceived that there are two leading conditions upon which the production of the stroke depends — a lessened strength in the vessel, and an increased tension on it."

Carbonic Oxide in Tobacco Smoke. — Dr. Otto Krause, in *Dingler's Polytechnic Journal*, states that he finds a considerable quantity of carbonic oxide constantly present in tobacco smoke, and that the after-effects of smoking are principally caused by this poisonous gas, as the smoker never can prevent a part of the smoke from descending to the lungs, and thus the poisoning is unavoidable. He is of opinion that the after-effects are all the more energetic, the more inexperienced the smoker is, and he thus explains the unpleasant results of the first attempts at smoking, which are generally ascribed to nicotine alone.

Weighing Babies. — The *Causeries Scientifiques* says that Dr. Groussin, of Bellevue, has contrived a machine (which he calls a *berceau-balance* or *pèse-bébé*) by means of which the anxious young mother may assure herself from day to day, or even from hour to hour, that the baby is going on satisfactorily as regards increase of weight. It consists of an ordinary cradle, to suit the taste, fitted with a balance underneath which will tell the exact weight of the cradle and its contents, without any need for disturbing the child. It is stated that after two complete days of life a child weighs 100 grammes — that is, 1500 grains (or about four ounces) — less than at birth. When a week old, it will be of the same weight as at birth. From seven days to five months the average increase should be twenty-five grammes (three quarters of an ounce) daily. At five months the weight should be double that at birth. At sixteen months the weight should be double that at five months. Of course, infants vary from time to time, and each individual has a rule of its own; the great point is that growth ought to be *constant*.

To Remove Foreign Bodies from the Eye. — A medical correspondent of the *Lancet* makes a suggestion which may prove useful on emergency to some of our readers. He says: "In consequence of the difficulty I experienced in removing from a patient a portion of steel deeply bedded in the cornea, which did not yield to spud or needle, some other means of removal became necessary. Dry, soft, white silk waste suggested itself to me, and was wound round a thin piece of wood, so as to completely envelop its end. This soft application was brushed once backwards and forwards horizontally over the part of the cornea where the foreign substance seemed fixed. To my astonishment it was at once entangled by the delicate but strong meshes of the silk, and was withdrawn with the greatest ease, caught by the same. A gentleman in turning steel at a lathe suddenly felt that a portion had entered his eye. He went at once to a surgeon, who with the most skilful manipulation failed to extract the same, saying it would soon work out of itself. The next morning the patient saw me, having suffered severely since the accident, and on the first application the portion of steel was extracted."

FACETIÆ.

"The Poetry of Health." — The London *Chemist and Druggist* says: "Mr Albert Ager, 'late medical dispenser to the Surrey Dispensary,' seems to think in rhyme. This is his misfortune rather than his crime, but the matter assumes a different aspect when he comes to print his meditations and offer them at one penny each. Under the title of 'The Poetry of Health,' this gentleman writes thirty verses, of which the following are specimens: —

If you are troubled with a cough
And thick phlegm your throat does stuff:
Take some squills, ipecacuanha,
And nitre in a regular manner.

When infants' eyes and nose drizzles
With red rash — oft have the measles;
Keep them warm, give saffron tea,
And a powder — soon well they 'll be.

When you have an attack of bile,
Out-pour a dose of castor oil;
If of plethoric habit — ought
To take a blue pill and black draught.

Future ages shall not say that this journal by neglect or unkind criticism checked the development of a genius springing from our own ranks."

Perseverance Rewarded. — A Texas newspaper asks us to believe that Mr. Hugo Byer committed an elaborate suicide in the following manner, from which it would appear that Texan poisons are much like "Western calomel": —

"On the 19th he took two ounces of laudanum; on the 20th he swallowed another two ounces of laudanum and three ounces of chloroform; on the 21st he partook of two ounces of chloroform and one third of an ounce of morphia; on the 22d he took four ounces of chloroform, and on the 23rd he drank two ounces of chloroform and one ounce of chloral. Still he lived until the 25th, when, in spite of the innocuous type of the poisons dispensed by the Texas drug stores, he was still dragging out his existence. So much perseverance, however, must ultimately lead to results, and we are not surprised to learn that death at last closed 'this strange eventful history.'"

SELECT FORMULÆ.

Violet Powder. — The London *Chemist and Druggist* gives this recipe: Powdered starch or potato farina 28 lbs., orris powder 1 lb. This will require about an ounce of perfume, varying according to fancy. A mixture of ambergris and bergamot, with a little musk, is a favorite odor, and some makers add a few drops of oil of rhodium. The powder should be sifted.

Antidote for Arsenic. — In the German Pharmacopœia an "Arsenic Antidote" is ordered. It is to be prepared thus: —

Solution of persulphate of soda	60 parts.
Water	120 "

Mix and add

Calcined magnesia	7 "

previously rubbed with

Water	120 "

These are to be shaken together until a soft regular mass is obtained. The solution of persulphate of iron is prepared by dissolving 40 parts of ferri sulph. pur. in 40 parts of aq. dist. Add acid sulph. pur., 7 parts; boil in a porcelain capsule; then add very gradually acid nitric pur., 12 parts, or until the solution does not decolorize a solution of permanganate of potassium. Evaporate to a solid mass, which dissolve in 40 parts of distilled water.

RECENT LETTERS FROM PHYSICIANS.

Every mail brings so many unsolicited voluntary testimonials to the great value of Cincho-Quinine, that we are embarrassed to find room for even a small part of them. It is unquestionably true that no therapeutical agent has ever been placed before physicians which has given more entire satisfaction than this combination of the bark alkaloids. The concurrent testimony of thousands of the most distinguished medical gentlemen in all parts of the country is unanimous in its favor.

Wauconda, Illinois, *June* 1, 1875.

Messrs. Billings, Clapp, & Co., — Your circular containing the assertion of the Chicago druggist that your Cincho-Quinine contained no quinine was received some time ago. To practical men the assertion of the Chicago druggist, or anybody else, is not of the least consequence. I have been using your Cincho-Quinine for several years, and for the last year to the entire exclusion of quinine; and I give it with as much assurance and obtain as effective and beneficial results, as can be obtained from quinine.

It was some time before I dared to trust it in congestive chills, but I give it now with as much confidence as I ever did quinine, and am not disappointed in its effects.

J. A. Hubbard, M. D.

Hempstead, New York, *June* 5, 1875.

I have used your Cincho-Quinine for several years; have found it answers the purpose for which it was given. Whenever a tonic is required, I am very much in the habit of giving it, as I prefer it much to the sulphate, as it does not affect the head so much, and is much more pleasant to take. I have taken considerable of it myself, and I prefer it much to the sulphate in my own case. G. N. Searing, M. D.

Hilliard, Ohio, *June* 7, 1875.

In an extensive practice in a malarial district, I am much pleased with the use of Cincho-Quinine, and can testify to its virtues as an antiperiodic, which I consider fully equal to the sulphate of quinine.

A very important consideration is that it is free from producing unpleasant head symptoms. R. Z. Seeds, M. D.

Bethel, Illinois, *June* 9, 1875.

I am using your Cincho-Quinine and have for the past year, and my experience is, that it is equal to quinine. In no instance have I had a failure. I think it equally efficient in every respect, while it is much more pleasant.

W. Watson, M. D.

Hillsdale, Michigan, *June* 3, 1875.

I have used Cincho-Quinine almost exclusively for the past four years; am delighted with it. It has the advantage of the sulphate that it does not produce headache, or any other disagreeable symptoms. C. C. Johnson, M. D.

Boston Journal of Chemistry.

VOLUME X. BOSTON, AUGUST, 1875. NUMBER 2.

Familiar Science.

NITRO-GLYCERINE, DYNAMITE, GIANT POWDER, LITHOFRACTEUR.

THE several names of explosive agents, as here given, often appear in newspapers and in circulars of dealers and manufacturers, but the agents are all essentially alike, and all depend upon nitro-glycerine as the source of explosive power. In other words, if there had been no nitro-glycerine, there could have been no dynamite, dualin, or other of the numerous mixtures with fancy names. The mixtures have no special merits of their own other than as they offer more safe or convenient methods of storing and using nitro-glycerine.

Dynamite is simply nitro-glycerine mixed with a peculiar silicious earth found in many places, but notably in Hanover. It acts as an absorbent, and renders nitro-glycerine more convenient to handle and safer to transport. It has a high absorptive power, being capable of taking up from two to three times its weight of nitro-glycerine without becoming pasty. Dynamite has a brown color, and resembles moist brown sugar. It usually contains from 60 to 70 per cent. of nitro-glycerine, and in this country it is sometimes sold under the name of *giant powder*. Nitro-glycerine, owing to its liquid condition, is liable to leak out of cans and bottles in transportation, and as it freezes readily, it is apt to burst the containing vessels by expansion, and thus become dangerous. Dynamite, on the other hand, although liable to be frozen, cannot leak or pass through ordinary crevices, and therefore it is the safer agent. A solid mass of frozen dynamite cannot be exploded, but if it is made pulverulent it can be fired even in the frozen condition.

The common impression is that dynamite and other compounds containing nitro-glycerine are very dangerous to handle, but such is not the case. It would be safe to put into the flame of a lamp a piece of dynamite of sufficient size to demolish a building if properly detonated. The agent would only burn in the lamp vigorously, not explosively; and the residue left upon combustion would be simply silica. Even moderate friction or percussion does not explode it, and it is safer to handle than gunpowder, under ordinary conditions. Terrible accidents have occurred from nitro-glycerine, but they happened under extraordinary circumstances. We have heard of no accidents from it when mixed with silicious earths or other proper absorbents. In order to fire dynamite it is necessary to use another explosive, and the fulminates are the best. A fuse containing a little fulminate of mercury is usually employed. Gunpowder will fire it, but not with certainty. An ounce of gunpowder may be flashed upon the surface of a pound of dynamite without exploding it. If however it should explode, the explosion would be comparatively slow and ineffective. If a large-sized percussion cap is exploded in a mass of dynamite the detonation is terrific; everything in contact with it is torn into fragments instantly.

No facts connected with the history of modern explosive agents are so interesting and wonderful as those relating to the methods by which perfect detonations are secured. To obtain instantaneous and perfect ignition and detonation a shock must be communicated to the whole mass of the agent at once. Decomposition cannot proceed instantly through a mass of nitro-glycerine, dynamite, or gun cotton without other influences than those needed to explode gunpowder, and the force of the explosion depends upon methods adapted to produce it. The suddenness of the explosion concentrates the blow, making it sharp and violent. An ounce of nitro-glycerine may be poured into a drill hole in a mass of rock, and slowly exploded by gunpowder or flame, and the whole force will be lost, as it will escape through the open orifice. Explode the same charge in the same hole without tamping by a fulminating fuse, and the rock is rent into fragments. The explosion is too sudden to allow the gases to escape by the open drill hole, and the effects are equal in all directions. A pound or two of nitro-glycerine poured into one of our heaviest pieces of ordnance and fired with the aid of a fulminate would shatter it completely. If nitro-glycerine be regarded as possessing nine times the force of gunpowder, one pound can be made to produce more destructive effects than twenty pounds of powder by methods of firing alone. Combustion and consequent decomposition proceeding slowly from one molecule of an explosive agent to another may be a harmless process, but hasten the action and very different results are produced.

Lithofracteur, so called, is an empirical mixture of nitro-glycerine with saltpetre, soda, sulphur, etc., and it is claimed that these substances, by ignition with the nitro-glycerine, increase the quantity of gases and consequently the explosive force. This is not correct; nitro-glycerine is so sudden in its explosion that nothing can be added to it to increase its power. It is probable that nitre, sulphur, etc., from their comparative slower burning, would be thrown from the mass of nitro-glycerine unignited at the instant of explosion.

Dynamite No. 2, as found in the market, is composed of about fifty per cent. of nitro-glycerine and a mixture of various substances, forming an empirical compound which has no special value other than what the nitro-glycerine gives it. Dynamite proper, as prepared from a mixture of the German silicious earth with nitro-glycerine, in the proportion of 70 per cent. of nitro-glycerine, in the proportion of 70 per cent. of the latter with 30 per cent. of the former, is the best compound yet afforded for practical use by miners, railroad excavators, etc. This agent is now extensively employed in all parts of the world, and the discovery of nitro-glycerine may be regarded as one of the most important that has occurred the present century.

Nitro-glycerine is prepared from the bland, sweet liquid obtained from fatty substances, like lard, palm-oil, etc., when distilled under proper conditions, at high temperatures. This clear liquid is well known under the name of glycerine, and is now largely used as a domestic remedy for various ailments. To convert this mild, inoffensive agent into the terrible compound which astonishes the world by its power, it is only necessary to subject it to the action of strong nitric acid in open vessels. Twenty years ago, it is probable, not a single pound of nitro-glycerine had been prepared in this country, and not twenty pounds had ever been prepared in Europe.

In 1860 a demand sprung up among homœopathic practitioners for a medicinal agent called *glonoine*, and after the most diligent investigations here and abroad, we ascertained that glonoine was simply an attenuated tincture of nitro-glycerine. Preparations were at once made to prepare the agent in our laboratory, and for several years we were the only parties in the country that manufactured nitro-glycerine, and from it *glonoine*. Our method was to arrange a dozen beaker glasses on a table, and into each about one drachm of pure glycerine was poured. The glasses were placed in refrigerating mixtures of ice and salt, or of nitrate of ammonia and water, and strong nitric acid, of specific gravity 1.45, mixed with twice its weight of sulphuric acid, was added drop by drop to the glycerine with constant stirring until perfect decomposition resulted. After thorough washing a clear liquid remained, of about the consistency of thin syrup. This was nitro-glycerine. One drop of this mixed with one hundred of alcohol formed glonoine, and it had the remarkable effect of producing intense headache when a single drop of the tincture was placed upon the tongue. A drop of the nitro-glycerine was placed upon an anvil and struck with a hammer, producing so violent a concussion that the striker was perfectly deaf for several weeks afterwards.

In the manufacture of nitro-glycerine in this small way, it was no unusual circumstance to lose one half the charges of the beaker glasses by spontaneous decomposition before the completion of the process. With the slightest rise in temperature above a certain point the contents of the glasses would effervesce violently, and evolve dense nitrous fumes, and the experiment come to an unsuccessful end.

The nitric acid alone contributes to the remarkable change produced in glycerine in the manufacture of nitro-glycerine, the sulphuric acid serving to absorb the water produced in the reactions. This is the office which sulphuric acid serves in the manufacture of gun-cotton. It is only employed with the nitric acid as an ab-

sorbent of aqueous moisture. The manufacture of nitro-glycerine upon a large scale involves no special complications of apparatus or machinery. The whole process is very simple, requiring only great care and skill in manipulation. In large works the glycerine is allowed to trickle into the acid slowly, and stone pitchers holding about ten pounds are employed for the decompositions, being placed under a hood, that the pernicious vapors may be carried away. The glycerine dropping into the acid mixture is rapidly acted on and converted into nitro-glycerine. The reaction may be indicated by the equation: —

Glycerine.	Nitric Acid.	Nitro-glycerine.	Water.
$C_3H_8O_3$	+ $3HNO_3$	= $C_3H_5N_3O_9$	+ $3H_2O$

Nitro-glycerine is composed of carbon, hydrogen, oxygen, nitrogen, the latter only resulting from the agency of the nitric acid. In this combination we have the elements existing in a condition of unstable equilibrium, and they are ready to separate whenever by elevation of temperature the oxygen and nitrogen can form new associations, and assume new physical conditions; and when this occurs tremendous physical changes must result in whatever impedes the chemical process.

THE CHEMISTRY OF OUR FOOD.

III.

The non-nitrogenous foods may be subdivided into the hydrocarbons, or fats; the carbohydrates, as starch, sugar, etc.; and substances that cannot strictly be included in either of these groups, as the vegetable acids.

The hydrocarbons and the carbohydrates, as their names at once suggest, are alike in containing hydrogen and carbon. They are also alike in containing oxygen, but differ in the relative proportion of that element entering into their composition, the hydrocarbons containing comparatively little of it. In round numbers, the proportion of the three elements in the fats may be stated as 79 per cent. of carbon, 11 of hydrogen, and 10 of oxygen. Chemically the fats are salts, formed by the combination of the so-called fatty acids (which, like many other acids familiar to the chemist, are not sour) and glycerine, or, to speak more precisely, a "radical" (sometimes called glyceryl) of which glycerine is a hydrate.

The carbohydrates are "hydrates of carbon;" that is, the hydrogen and oxygen in their composition are in the same proportions as in water. In a certain sense, therefore, they may be said to consist of charcoal and water, though it does not follow that they have been formed by the chemical combination of water as such with carbon. The proportion in which the elements exist in them, roughly stated, is 40 to 45 per cent. of carbon, 6 to 7 of hydrogen, and 49 to 55 of oxygen.

The most important of the carbohydrates is *starch*, which, indeed, estimated by quantity, is to be placed first among all the nutritive principles that make up the food of man. The amount of starch he consumes varies greatly with conditions of race, climate, etc., but he always eats more starch than anything else. This substance may therefore claim a more extended consideration.

It is to be noted that starch is a purely *vegetable* product. The leading nitrogenous foods, as we have seen, are found both in plants and in animals; and the same is true of the fats or oils, which are widely distributed through the vegetable kingdom, and are particularly abundant in seeds. But starch is met with only in vegetable substances. It is stored up in the form of little granules or solid particles, in many seeds, roots, and stems, and in some fruits. The granules are made up of a series of concentric layers, the outside one being harder than the rest, and vary in diameter from the 200th to the 3500th of an inch, according to the plant that yields them. In the potato, for instance (Fig. 1), the microscope shows that they are much larger than in wheat flour (Fig. 2), and on the former the

Fig. 1.

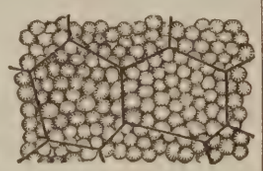

Fig. 2.

lines indicating the different layers are readily made out. As the grains from the same plant are quite uniform in size and shape, while they vary much in different species, the adulteration of one kind of starch with another, or of other substances with starch, can be detected by a microscopical examination. Dr. Hassall, in his interesting work on "Adulterations in Food and Medicine," gives a variety of examples of such mixtures, with illustrations showing their appearance under the microscope.

Starch is also the food of plants, but only in the very first stage of their existence, while in the case of man and other animals that is the only period in which it is *not* available for their sustenance. It is the form in which food is stored up in the seed for the growth of the embryo plant before it can draw nourishment from the earth and air. It sometimes surrounds the embryo, as in the seed of the onion (Fig. 3), and

Fig. 3.

Fig. 4.

sometimes it is found in the cotyledons, or seed-leaves, of the embryo itself, as in the bean (Fig. 4). In the plant, however, as in the animal, it must undergo a chemical metamorphosis before it can be digested and assimilated by the organism. This is a process to which we shall have occasion to refer in another connection.

The *sugars* are another important class of carbohydrates. There are about a dozen of them, nearly identical in composition, and resembling common or cane sugar more or less closely in their general properties. As they have been the subject of several articles in former volumes of the Journal, we need not dwell upon them here. Unlike starch, sugar is an animal as well as a vegetable product. Lactin, or milk-sugar, is a familiar substance. Inosite, or muscle-sugar, is of recent discovery, having been first found by Scherer among the constituents of the juice of flesh. According to Lehmann it has hitherto been obtained only from the flesh of the heart. In some of its chemical reactions it differs from the other kinds of sugar.

Gum, like starch, is found extensively in the vegetable kingdom, being an ingredient in the juices of nearly all plants. It is generally regarded as a nutritive principle, but thus far all the researches of physiologists and chemists have failed to determine definitely what becomes of it in the process of digestion.

Dextrine does not occur as a natural product, but is an artificial gum obtained by the transformation of starch through the agency of heat, and in other ways which will be more appropriately considered in another connection. As it is readily convertible into sugar by some of the digestive secretions, it is probable that it is thus metamorphosed and assimilated in the system. The brownish glaze which is seen on the crust of a wheaten loaf is dextrine, formed from the starch of the flour by the excess of heat to which the outside of the loaf has been exposed in baking.

The vegetable acids differ chemically from the carbohydrates in having more oxygen than is required to form water with the hydrogen. There are many of them, but only a few are interesting in connection with the subject of food. Malic acid is abundant in apples, plums, gooseberries, cherries, currants, and most of the common fruits. It is found also in the garden rhubarb and in various wild berries. Tartaric acid occurs in the grape, and is found in pine-apples and other fruits, and in the potato and other tubers. Citric acid is largely present in the lemon, and it is generally associated with malic acid in the ordinary fruits. Oxalic acid is found in most plants, abundantly in the garden rhubarb and sorrel. Acetic acid, or vinegar, is very rarely present in living plants; but it is frequently produced when their juices are fermenting. All these acids exist in plants combined with metals — potassium, etc. — which neutralize their sour taste; but they are often in a free state, and hence render the vegetable juices acid. The chief dietetic value of the vegetable acids is their anti-scorbutic property, which is very remarkable.

CARNIVOROUS PLANTS.

It has long been known that certain plants catch and kill insects, but only very recently has it been suspected that they devour and digest their prey. The matter has attracted a great deal of attention of late, both in this country and in Europe, and many careful observers are fully satisfied that these plants are really carnivorous. Others, among whom are some eminent foreign botanists, hold that the captured insects are devoured by bacteria, which may be detected by the microscope in the putrefying animal matter. A piece of meat placed on a leaf of *Drosera* disappears in the same way, but, according to these authorities, it is consumed by the bacteria as it decomposes, and is not absorbed by the plant.

The weight of evidence, however, appears to be on the other side. The more closely these plants are studied, the more clearly is their carnivorous character indicated. At a recent meeting of the Edinburgh Botanical Society, Dr. Balfour read notes of experiments he had been making on *Dionæa muscipula* and allied plants. These experiments confirmed the suspicions entertained by Ellis, Curtis, Hooker, and Darwin that the *Dionæa* is a carnivorous and, it may be added, a most brutal plant. Dr. Balfour classified

the facts he had observed in regard to it under the heads of irritability, contraction, secretion, digestion, and absorption. The irritability, it seems, is resident in six delicate hairs, so placed on the surface of the leaf that no insect can avoid touching them in crawling over. Dr. Balfour touched with a needle every other part of the leaf, and no response followed; but no sooner was the point applied to one of those hairs than a contraction of the leaf ensued. Chloroform dropped on a hair caused the leaf to close like a winking eye, but water had no such effect. It was only when the object seized was capable of affording nutrition that the contraction continued for any considerable length of time. A piece of wood was soon released, and so was a dried fly; but when a live fly or caterpillar or spider was inclosed the contraction lasted on an average for about three weeks. The leaf at the same time gave out a viscous acid secretion. This appeared to be only the case when an insect was captured, and it was always present on such occasions; but whereas with a fat spider it was abundant, with a shrivelled fly there was very little. In proof that nourishment is obtained from insects so inclosed, Dr. Balfour pointed significantly to the facts that young plants of *Dionæa* under bell-glasses had been found not to thrive so well as those left free, and that while a piece of beef wrapped in another leaf became putrid, a piece inclosed by the *Dionæa* remained perfectly inodorous, but soon lost its red color, and was gradually disintegrated more and more till it was reduced to pulp. This statement, showing the greediness and ferocity of the plant, created quite a painful sensation among the members of the Botanical Society, and the chairman, while recommending a continuance of the experiments, wisely suggested that they should be completed before the Anti-Vivisection Act comes into operation, since otherwise Dr. Balfour may get into trouble.

It is said that Mr. Darwin is preparing a book on these flesh-eating plants. If so, we are likely to know the truth in regard to them, for, however opinions may differ in regard to Mr. Darwin as a theorist, there is no question about his accuracy and thoroughness as an observer and a collector of facts.

HYGIEIA.

The following attractive portraiture of the goddess of health is from the introduction to the Report on Hygiene read by Dr. Benj. Lee, of Philadelphia, at the recent annual meeting of the Medical Society of the State of Pennsylvania: —

Hygieia, the "sweet, smiling goddess of health," was one of the fairest conceptions of an age which combined, in an exceptional degree, poetry of thought with clearness of judgment, owing, perhaps, to the very fact that it appreciated so much more thoroughly than any other (unless it may have been the Mosaic) the absolute necessity of corporeal sanity to the existence of mental sanity, and was, therefore, not ashamed of this human form, which the Creator himself, having moulded after his own likeness, contemplated with unmixed admiration, and pronounced superlatively "good." This age of poets, sages, and artists lavished all its wonderful powers of creative genius in giving expression to its ideal of that divinity whose special care should be the bestowment and maintenance of physical health. The embodiment must needs be feminine, because the mother, the nurse, the wife, have for their special function that daily ministry to the bodily welfare and necessities of offspring and of husband, that constant presence in and care of the home, which are the two essentials of health in the family and in the individual. She must needs be youthful, as presenting ever to the mind of the entranced beholder that period of life when a blood unvitiated by vice or excess courses through a frame unmarred by violence or exposure, and colors a cheek unstained by sin. Purity must look forth from her eyes, and truth sit enthroned on her brow; for unbridled passion and soul-torturing deceit are equally inimical to the perfect preservation of health. Her form must be lithe, vigorous, and well nourished, but not redundant, as showing her adorers that neither asceticism on the one hand, nor gluttony and voluptuousness on the other, are allowed in her worship, encouraging activity as contrasted with indolence. Cheerfulness must radiate from her every feature, since gloom and despondency are the recognized foes of sanity, whether of body or mind; and over all, pervading expression of face and pose of limb, must be that indescribable charm of gentleness, as teaching her votaries that in the mutual interchange of kindly sentiment and act they should greatly promote the common health and common weal. And so has the lovely inspiration come down to us, immortalized by the sculptor's art, a joyous maiden, full of tender grace, robed in chaste and flowing vestment.

WAX FRUIT MAKING.

Closely allied to wax flower making is that of wax fruit, some specimens of which are marvellous for their faithful imitation of nature. Here moulding or casting is of more importance than in flower making, seeing that accuracy of form is the chief desideratum. Most kinds of imitative fruit are shaped in double moulds, one for each half, and if the fruit is irregular in its curvatures a tripartite mould may be needed. Say that an orange is to be imitated in wax; a smooth, damp surface of sand is prepared, into which exactly one half of a good orange is carefully pressed; a cordon or border of tin or stiff paper is built up around it at about half an inch distance from the orange on all sides; plaster of Paris, in a cream-like consistency, is poured into the cell thus made, so as to fully cover the orange; when quite firm enough to handle, this plaster half-mould is taken up and the orange extricated; the orange is turned over in the sand and another half-mould made in a similar way. Whether fruit is cast solid or hollow depends mainly on the size; if large, the mass would be heavy and much wax wasted by solid casting; in this case a core of some rough material is fixed in the middle of the mould, which gives a cavity to the middle of the fruit. Soft kinds of fruit, such as plums, cherries, and ripe pears, and some hard and unyielding fruits, require special management to extricate them from the half-mould without injury to the fruit on the one hand or to the mould on the other. Pomegranates, medlars, pine-apples, etc., require moulds in more than two parts. Occasionally, elastic moulds of glue are found advantageous. Generally speaking, the color of the wax employed is that of the lightest parts of the fruit, the deeper tints being afterwards laid on with brush or pencil. The chief pigments employed are such as burnt and raw umber and sienna, chrome yellow, red lead, Prussian blue, carmine, lake, etc., greens being produced by various admixtures of blue and yellow. Certain small varieties of fruit, such as grapes and currants, are made of glass bulbs, carefully blown to the proper shape; these are fixed by wax to wire inserted into holes, and are then dipped into melted wax of the proper color, a very thin coating of which gives the proper kind of semi-transparency to the glass, and at the same time a smoothness of surface not inaptly resembling that of the natural fruit. The fastening of the various fruits to imitative stems, leaves, leaflets, etc., is an affair of wires, silken thread, strips of green paper, white flock, arrowroot-paste, gum-mastic, varnish, with other simple materials and tools employed in artificial flower making.

HINTS FOR EXPERIMENTS.

Experiments with Electricity. — Cadogan Morgan, in 1785, was the first experimenter who produced the electrical light in the interior of solid bodies. He inserted two wires in wood, and caused the spark to pass between them. The wood was illuminated with blood-red or with yellow light, according as the depth at which the spark was produced was greater or less. Many of the readers of the Journal have doubtless seen an egg or a series of eggs lighted up by being placed in the line of discharge of a Leyden jar. An ivory ball, an orange, or an apple may be illuminated in a similar way. According to Tyndall, a lemon is especially suited to this experiment, "flashing forth at every spark as a spheroid of brilliant golden light." The wires used for the discharge should be brought within about half an inch of each other inside the lemon.

Decomposing Liquids with the Battery. — In concluding his lectures "On Chemical Force," at the Royal Institution, Professor Gladstone, F. R. S., described a series of experiments recently made by himself and Mr. Tribe, by means of what is called the copper-zinc couple. When thin sheets of zinc are immersed in a solution of cupric sulphate, copper is deposited upon it in a minute state of division, and thus the two metals touch at myriads of points. When this couple is immersed in a binary liquid, the liquid at each point of junction is exposed to the full chemical or electro-motive force of the metals. It was shown that this obviates the great difficulty there often is in decomposing a liquid on account of the "resistance" which it offers, and the lecturer exhibited the breaking up in this way of pure water, iodide of ethyl, chloroform, and many other substances, with the production of pure hydrogen, zinc-ethyl, hydrides, etc., and several bodies previously unknown, some of which are spontaneously inflammable in the air. The copper-zinc couple has been practically applied to the production of certain organic compounds, and to the determination of nitrates in potable waters.

Cheap Substitute for a Single Microscope. — The object of a lens in a microscope is to enable us to see a minute object distinctly at a less distance than the natural standard of vision, as by so doing we view it under a larger angle; but in point of fact we can to a certain extent accomplish the same object without any lens at all. Take a card and blacken one side of it, then pierce it with a fine sewing needle and look through the hole at any small object, strongly illuminated, and held about an inch from it; the object will appear considerably magnified. In this case the use of the perforated card enables the object to be brought about ten times nearer the eye than the ordinary distance of distinct vision, and hence it appears about ten times larger.

In this experiment the effect is equivalent to reducing the pupil to the size of the needle hole, so that the amount of light entering the eye is correspondingly reduced; hence the object must be strongly illuminated to render it visible.

Experiment in Phosphorescence. — A writer in the *English Mechanic* says that if freshly-prepared chloride of lime be thrown into a dilute acid, *in the dark*, distinct greenish-white phosphorescent fumes are seen to rise from the vessel, while the temperature of the mixture rises sensibly. The phosphorescent appearance lasts only two or three

seconds. The nature of the acid does not seem to have much influence on the result.

CULINARY HINTS.

Rhubarb Marmalade. — The following is an English recipe: Take 1¼ lbs. of rhubarb, 1 lb. of lump sugar, one lemon. Cut the rhubarb (after peeling) into square pieces, the shape and size of dice; chip the lemon on the top of it; cover the whole in an earthen vessel with fine white sugar, and let it stand at least 12 hours. Next morning, pour off the liquid (leaving the rhubarb behind), and boil the juice for some time. The exact length of time cannot be fixed, as some kinds of rhubarb produce more liquid than others, but it must be boiled until it becomes syrupy. Next put the lemon into the syrup, also the rhubarb, and boil all together till the rhubarb becomes tender. Place in jars, and treat exactly as is done with preserves. If a ginger flavor is wished, put some of the best ginger (bruised) into the liquid when it is just poured off the rhubarb, and boil it along with it.

Vegetable Marrow Preserve. — This, which is from the same source, makes a nice substitute for preserved ginger. Peel and cut the marrow in four, take out the seeds, then cut it into pieces about the size of a finger; sprinkle fine white sugar over it, and let it stand until it makes some liquid. Use equal weight of sugar to that of the cut marrow. Boil the liquid from the marrow along with the rest of the sugar and sliced lemons (one lemon to each pound of sugar), until the syrup begins to thicken. Then put in the pieces of marrow and boil all for 20 to 30 minutes. When cool, add essence of ginger; quarter of an ounce to each pound of marrow is generally found the right quantity; but as tastes differ, it may be increased or lessened as desired.

Practical Chemistry and the Arts.

THE SCIENCE OF ADULTERATION.

BY S. P. SHARPLES, STATE ASSAYER.

VII.

The skill of the sophisticators is by no means confined to articles of food and drink. This is well illustrated by a controversy that has been recently taking place between the wool manufacturers and the Secretary of the Treasury. The wool manufacturers complain that a certain class of goods is being imported at a low rate of duty which should pay a much higher duty. They say that these contain wool, whereas they are imported as containing only hair and vegetable fibre. The Treasury Department is at a loss what to do in the matter. They have employed experts to examine the goods, and they have failed to decide the question; the fact being that sheep produce both hair and wool, and that it is impossible to distinguish between the hair of a sheep and the hair of certain other animals. Further, the fine hair found next the skin of many animals closely resembles wool; so that the microscope fails to distinguish whether the article is made of hair or wool. Chemistry is equally at a loss, the ultimate composition being the same.

Linen is extensively adulterated with cotton. The microscope will at once show this mixture, but it fails to distinguish between linen and certain other fibres.

The mixture of cotton and wool has passed beyond the point at which it can be called an adulteration. Certain goods, such as flannels, are regularly made partly of cotton, and are more desirable than if made entirely of wool, as they do not shrink so much in washing.

The adulteration of woolen goods with second-hand wool has become so notorious that it has supplied a new word to the language, and the "shoddy" business has become large and respectable. Old woolen rags were formerly of little value, being used mainly for making cyanides or as a fertilizer for hops. Now they are run through a machine, torn to pieces, carded, and the longest and best of the wool used for mixing with new wool to make cloth. The shortest of the fibres, or dust, is used for making velvet or flock paper for covering walls, and for various other purposes. This shoddy cloth looks well at first, but it soon wears out and becomes useless. The shoddy made from old carpets is used for making wool mattresses.

Recently, considerable attention has been called to the practice of weighting black silks. Some of the heavy silks are said to be fully one half dye-stuff and mordant. Nor do cotton cloths escape this process; they are "finished" with starch and china clay.

In the course of a recent discussion of this subject before the London Society of Arts, some of the members claimed that pure unweighted cloths could not be sold in the Indian and Chinese markets, and that in order to sell their goods at a profit they must be weighted. This is a plea that is frequently brought forward by such gentlemen, but it is radically and totally false. The public will buy whatever they find in the market, and they are not slow to learn where they get the best goods for their money. In this connection I must notice the recent discussion in the New York Dairy Association in regard to coloring butter and cheese. They decided it was justifiable, or, in other words, that a man who makes a white, unsalable article is entitled to color it, so as to mislead people into thinking it good and rich.

MEMORANDA IN THE ARTS.

Quick Work. — We have before given examples of the quickness with which wool can be spun, dyed, woven, and made into wearing apparel, but a recent instance reported by a New York journal surpasses any previous achievement of the kind. In this case, the proprietors of an alpaca factory at Jamestown (N. Y.) succeeded in manufacturing cloth from the wool of the Angora goat, and having it worn in the form of a mohair dress, within the incredibly short period of *twelve* hours. The details are given as follows: "Nearly a year ago Mr. H. A. Whittemore purchased two Angora goats, and conveyed them to his farm at Fluvana. Early this morning, before dawn, they were taken to the alpaca factory, and the work of shearing commenced, by a preconcerted arrangement the last clip of the shears being given as the first rays of the sun were visible in the east. The wool was then seized by the workmen in waiting, was washed, bleached, dried, and passed through the various preparations for combing; was combed, spun, woven into cloth, and passed into the hands of the dressmaker at two o'clock this afternoon, and it will probably appear upon the person of Miss Jennie Whittemore about the time this article goes to press — any way, long before the setting of the sun, the given time. It seems hardly credible that such a work could be performed in so short a time, but if we are to believe the evidence of our own senses and the veracity of the gentlemen who have had the work in charge, it is certainly so, and the wool that this morning was protecting an Angora goat, is to-night a beautiful mohair dress, performing the same office for a favored young lady."

Cannon *versus* Cuirass. — An experiment, as we learn from *Iron*, was lately made at Krupp's works in Prussia which seems to threaten the future of armor-clad ships of war. Hitherto, as is well known, the solidity of the cuirass has pretty well kept pace with the calibre of the ordnance destined to do the work of destruction. By a felicitous idea, however, the force of the cannon has now been quadrupled. The invention, if so it may be called, consists in directing four guns towards the same spot, and firing them simultaneously by electric ignition. To test this new method, a target was constructed by Herr Krupp consisting of two 10-inch plates, a wooden layer 200 millimetres thick, two 6-inch plates, and another layer of wood 200 millimetres thick, the whole lined by an iron layer 1½ inch thick. At a distance of 200 metres from this target were placed four 26-centimetre cannon, the calibre of which may be imagined from the fact that each requires 42 kilogs. of prismatic powder. The first simultaneous discharge of the four guns, which were loaded with long cubic grenades, tore away large pieces of the iron plates, and so shook the target as essentially to diminish its resisting power. Other discharges seem to have had an even more destructive effect. As the power of the German breech-loading gun is greatest at 400 metres, at which distance the naval engagements of the future are likely to open, the experiment is supposed by some to have decided the long-pending controversy of cannon *versus* cuirass.

A Locomotive on Legs. — A novelty in the shape of a hill-climbing engine was lately exhibited in France. This engine has no wheels, and consequently does not roll, but in place of them it is furnished with what may be called legs, upon which it walks, runs, or gallops. It is like an ordinary engine in most respects, but is supplied with straight rods, terminating in broad, circular skates. There are three of these legs in front and three behind. The cylinders, in place of actuating wheels, raise the feet. The invention is claimed to be especially adapted for carrying great weights up an incline. One of them at work on the Eastern railway weighs ten tons, and runs seven to eight kilometres (4 to 5 miles) an hour, and can accomplish twenty kilometres (12½ miles) if desired.

Cooking Rations on the March. — In some divisions of the Italian army an innovation has been introduced for cooking rations so quickly, whilst on the march, that immediately on a halt the meal due can be eaten. The invention rests on the principle of the isolation of heat, and its operation is very easy and simple, the whole apparatus consisting only of a camp kettle with an hermetically-sealed cover. As soon as the water boils, the kettle is placed in an isolating sack, of cylinder form, and by this mode the water retains its heat, and cooks the meal of the soldier during his march. As the kettle is air-tight, the soup made is more nourishing and agreeable to the taste than if made by the old process. The apparatus is constructed with the least possible surroundings, so that it can be transported over mountains on the backs of horses or mules.

Sham Silk and Woolen Goods. — An English journal states that goods made entirely of cotton are called merino, and have the look of merino owing to the woolly surface imparted to them. Such goods are sold both in the United States and in the Spanish South American markets in large quantities, especially in men's under-shirts and drawers. To cause the cotton to resemble wool, it is scratched, and the surface raised by a particular process. If you will draw a thread or two out and

burn them in the flame of a taper, if the material be cotton it will consume to a light, impalpable, white ash, cotton being a vegetable fibre; but if, on the contrary, it is wool, and therefore an animal fibre, it will twist and curl in the flame, and show a black ash, accompanied with a smell which will speak as to its origin. Cotton is now so cleverly treated that it is frequently taken for silk, also an animal fibre, and this simple test is always resorted to when there is any doubt upon this point.

INVENTION WANTED. — The president of a Philadelphia street railway makes the following seductive appeal to any inventor who is disposed to furnish him a device worth at least half a million for the generous sum he names: "Believing that the horse has served his time before the street car, and that American ingenuity should allow him to retire before our centennial anniversary, by inventing some improved motor for street passenger railways, we offer $5000 reward to any person or persons who will invent, perfect, and present to this company any satisfactory device that will propel our cars and can be used on the streets of Philadelphia, provided it is acceptable to this company, and its control placed exclusively with us."

PRACTICAL RECIPES.

ARTIFICIAL IVORY. — Two pounds of pure india-rubber are dissolved in thirty-two pounds of chloroform, and the solution saturated with purified ammoniacal gas. The chloroform is then distilled off at a temperature of 185° F. The residue is mixed with pulverized phosphate of calcium or carbonate of zinc, pressed into moulds, and cooled. When the phosphate of calcium is used, the resulting compound partakes in a great degree of the nature and composition of genuine ivory, for we have the requisite proportion of the phosphate and the india-rubber, which takes the place of the cartilage: the other component parts of the genuine article are of little importance.

PREPARATION OF WASHING BLUE. — Twenty lbs. white potato starch, twenty lbs. wheat starch, twenty lbs. Prussian blue, two lbs. indigo carmine, and two lbs. finely ground gum arabic are mixed in a trough, with the gradual addition of sufficient water to form a half-fluid homogeneous mass, which is poured out on a board with strips tacked to the edges. It is then allowed to dry in a heated room until it does not run together again when cut. It is next cut, by a suitable cutter, into little cubes, and allowed to dry perfectly. They are finished by being placed in a revolving drum, with a proper quantity of dry and finely pulverized Paris blue, until they have a handsome appearance. The cost is about 12 cents per lb.

BLACK STENCIL INK. — Take of shellac two parts, borax one part, soft water ten parts, gum arabic one part, lampblack sufficient quantity, indigo sufficient quantity. Boil the shellac and the borax in the water until they are dissolved, add the gum arabic, and withdraw the mixture from the fire. When cold add lamp-black to bring it to a suitable color and consistence, and lastly, a very small quantity of finely-powdered indigo to give it a "jet" shade. Keep in glass or earthenware vessels.

IMITATION GROUND GLASS THAT STEAM WILL NOT DESTROY. — Put a piece of putty in muslin, twist the fabric tight, and tie it into the shape of a pad; well clean the glass first, and then pat it all over. The putty will exude sufficiently through the muslin to render the stain opaque. Let it dry hard, and then varnish. If a pattern is required, cut it out in paper as a stencil; place it so as not to slip, and proceed as above, removing the stencil when finished. If there should be any objection to the existence of the clear spaces, cover with slightly opaque varnish.

Agriculture.

MR. LAWES ON THE MANURE FROM THE FEEDING OF ANIMALS.

A CORRESPONDENT of the London *Agricultural Gazette* having criticised some of Mr. Lawes's statements regarding the value of manures from the feed of animals, that gentleman makes the following reply: —

In some experiments which we conducted many years ago in the boxes at Woburn Park Farm, 44 oxen were liberally fed for an average period of 53 days. Every particle of food, litter, and dung was carefully weighed, and the proportion of dung produced to food consumed and litter used was considerably higher than supposed by Mr. Biddell. Whether we judge from those results, or whether we assume that one eighth of the 8 cwt. of straw would be consumed as food, and calculate the amount of dung from the quantity used as litter, it is pretty certain that the amount of dung produced from the quantities of food and litter above enumerated would be considerably more than 1 ton. Any error of this sort in the estimate of the amount of dung produced, although it would of course materially affect the estimate of the value of the dung per ton, and bring down Mr. Biddell's estimate of 15*s.* per ton accordingly, would not affect the question of the value of the manurial constituents which would be obtained from the given amounts of food and litter. I will therefore, for the sake of argument, adopt Mr. Biddell's estimate, and assume that the quantities of food and litter stated by him will produce only 1 ton of dung in four weeks; or, as it will be more convenient to base my calculations on the production of 10 tons of dung, I will assume that 10 oxen were fed for four weeks in the manner described, and that they produced 10 tons of dung.

We have, then, to ascertain what is the amount and the value of the constituents in the manure produced from the quantities of food and litter supposed, and to compare them with those in 5 cwt. of Peruvian guano; and as the value of Peruvian guano depends entirely on the amount it contains of nitrogen (reckoned as ammonia), phosphoric acid (reckoned as phosphate of lime), and potash, we may confine our attention to the amount of those in the manure obtained by the feeding experiment. The following table shows the amounts of these constituents in the food and litter, supposing them to be of average quality: —

	Fresh Food.	Nitrogen, reckoned as Ammonia.	Phosphoric Acid, reckoned as Phosphate of Lime.	Potash.
Linseed cake . .	840 lbs.	48	41	14
Cotton cake (undecorticated) .	840 lbs.	38	46	17
Wheat-meal . .	840 lbs.	18	16	4
Mangel	12½ tons.	85	25	70
Straw (as food and litter) . .	4 tons.	65	49	58
Total . . .	-	254	177	163

The above amounts of food, with 28 lbs. of the straw consumed as food per head per week, and the remainder used as litter, would probably yield between 500 and 600 lbs. increase in live weight. If we say 600 lbs. this would not contain more than — nitrogen, 9 lbs.; mineral matter, 10 lbs. And if we reckon the nitrogen as ammonia, and suppose that the mineral matter of the increase of the fattening animals contains a rather smaller proportion of phosphate of lime, and a rather larger proportion of potash than the mineral matter of the whole animal, we have to deduct from the constituents in the food and litter — nitrogen (as ammonia), phosphate of lime, and potash, in the increase, as below: —

	Nitrogen, reckoned as Ammonia.	Phosphoric Acid, reckoned as Phosphate of Lime.	Potash.
	Lbs.	Lbs.	Lbs.
In food and litter . . .	254	177	163
In increase	11	8	1
Difference	243	169	162

These, then, are the amounts of manurial constituents that would be obtained from the food consumed and litter used, provided there were no loss whatever, excepting by the increase in live weight of the animal. Let us now compare these amounts with the amounts of the same constituents contained in 5 cwt. of Peruvian guano. Peruvian guano of good quality may be reckoned to contain 12 per cent. of ammonia, 25 per cent. of phosphate of lime, and 3 per cent of potash. We have, therefore —

	Ammonia.	Phosphate of Lime.	Potash.
	Lbs.	Lbs.	Lbs.
In food and litter, less increase	243	169	162
In 5 cwt. Peruvian guano . .	67	140	17
Difference	176	29	145

Showing a balance of all three constituents greatly in favor of the dung.

The next point is as to the value of the manure in the two cases. Mr. Biddell assumes that the 5 cwt. of Peruvian guano will cost 70*s.* If we reckon the phosphate of lime it contains to be worth 1*d.* per lb., and the potash 2*d.* per lb., the value of these constituents in the 5 cwt. of guano will be 14*s.* 6*d.*, leaving 55*s.* 6*d.* for the 67 lbs. of ammonia, or almost exactly 10*d.* per lb. If, after deducting only the constituents of the increase in live weight from those in the food and litter, we reckon the remaining constituents at the same rate as they cost in Peruvian guano, we have the following results: —

243 lbs. ammonia at 10*d.* . . .	£10 2 6
169 lbs. phosphate of lime at 1*d.* . .	0 14 1
162 lbs. potash at 2*d.*	1 7 0
	£12 3 7
5 cwt. Peruvian guano . .	3 10 0
	£8 13 7

Thus, then, if we assume there is no loss of ammonia, phosphate of lime, or potash, in the conversion of the food and litter into dung, besides the amounts retained in the increase, and if we estimate the value of the remaining constituents at the same rate as they cost in Peruvian guano, there would be a balance of £8 13*s.* 7*d.* in favor of the dung, as compared with 5 cwt. of Peruvian guano. Or, if we reckon the ammonia at 1*s.* per lb. in both manures, and leave out of the calculation the phosphate of lime and potash, the guano would be worth 67*s.*, and the dung 243*s.*, showing, on this mode of calculation, a difference of £8 16*s.* in favor of the dung.

But, according to the table and scale of deductions given in my paper, the dung would be valued at only £7 13*s.* 8*d.* instead of £12 3*s.* 7*d.*, or more than one third less than if we were to assume that there is no loss, and that the constituents are of the same value per lb. as in guano. Whether, in the valuation of the dung according to my scale, the deduction of more than one third which I make for loss of constituents in the collection and making of the dung, and for the slowness of its action compared with guano, be sufficient, is a question fairly open for consideration. Although I fully appreciate the effects and

value of artificial manures, I am certainly not prepared to admit that 5 cwt. of Peruvian guano would produce as much increase of crop as the manure produced from the food and litter of 10 oxen fed for four weeks, as above described.

POTASH FOR SOILS.

We have so often spoken of the great value of potash as a fertilizing agent upon our exhausted soils, it is not without some hesitation that we again allude to the subject. We suppose that almost every agriculturist nowadays has some general idea of the principle of restitution; that is to say, the elements necessary to the growth of vegetables must be replaced; and if they are not, the crop either fails utterly, or at best is deficient in health and growth. The amount of these elements, phosphorus, lime, potash, and several others, to be replaced, varies according to the vegetables cultivated. Thus a potato crop from seven and a half acres of land takes away the seed constituents of four wheat crops, besides about 600 pounds of potash. The average turnip produce of the same area removes the seed constituents of four wheat crops and about 1000 pounds of potash. Similarly also grapes, clover, peas, beans, and nearly all leguminous vegetables, remove potash in immense quantities. It is evident that in such cases potash is the material which the land most requires to produce a new crop. To buy potash and add it to the soil would be expensive; true, it may be produced in combination with other substances in various fertilizers, but there is a much simpler source for it, and that source is the wood-ash heap, which otherwise the soap-maker purchases.

Professor Storer, in a paper on the fertilizing properties of wood ashes, says: —

"The analysis of thirteen samples of house ashes, shows a range of from 6 to 10.8 per cent. of potash and from 0.4 to 4.6 per cent. of phosphoric acid. The lowest percentages of potash, 6 to 6.5, were from ashes of a mixture of maple, oak, and white pine wood, collected by a soap-boiler in a country village. The highest percentages, 10 to 10.8, were in ashes of mixed beech, birch, and maple in one case, and in those of pitch-pine in the other. Eight of the samples ranged, as to potash, from 7.4 to 9.5, the average of them, as well as that of all the thirteen samples, being about 8½ per cent. This, it must be borne in mind, is the proportion of the chemist's potash or oxide of potassium, and corresponds to about 10½ per cent. of the potash of commerce, which is an impure carbonate and hydrate of potassium. The average of phosphoric acid in dry commercial wood ashes, whether unleached or leached, is about two per cent., a much less quantity than would be inferred from the composition of the 'pure ash' of many woods. This phosphoric acid is also a valuable fertilizing material in the majority of soils. The balance of the elements contained in the ash, namely, silica, alumina, iron and manganese oxide, lime, soda, etc., are of no or little account; so that on what the potash, first, and the phophoric acid, second, contained, mainly depends the value of wood ashes as a fertilizer. The material is besides a useful dressing for the ground about orchard trees, as it not only improves the soil, but prevents in a considerable degree the inroads of insects in the roots and bark. It only remains for us to show that there is not merely a loss to the land affected, but that a direct expenditure of money is the result of using ashes in a manner otherwise than we have pointed out. In order to thrive, the farmer must keep his land in producing condition; and, as we have already remarked, to soils which require potash, potash must be returned. Potash is worth about 6 cents a pound, and phosphoric acid is sold in the New York market for about 12½ cents for the same quantity. A barrel of wood ashes is bought by the soap-maker for say 22 cents, and it weighs 125 pounds. These ashes contain on an average, as we have already shown, 8 per cent. or 10 pounds, of potash, and besides include two per cent., or two and a half pounds, of phosphoric acid. According to the above prices, the total value of these substances is 91 cents, and therefore a barrel of ashes is intrinsically worth as a fertilizer nearly five times the amount for which it can be sold to the soap manufacturer."

"Ashes," says the *Rural New Yorker*, "contain the essential components of all crops. They should not be mixed with compost (there is no gain in so mixing them) but applied broadcast directly to the soil, whether it is grass or arable land. We never knew a farmer who could get more ashes than it was profitable to apply to his land. One hundred bushels per acre is not too much to apply to old cultivated lands. Especially are ashes excellent for orchards. They should not be heaped right about the bodies of the trees, but spread over the roots, which extend as far from the bodies of the trees as the branches do. Ashes are especially valuable as top-dressing on old grass land, or on lands cropped with grain. For root crops they are equally important; indeed, there is no crop grown and no land cultivated that is not benefited in a greater or less degree by the application of leached or unleached ashes, the latter being more valuable."

THE FARM AT THE STATE AGRICULTURAL COLLEGE.

We are pleased to learn from the *Springfield Republican* that this tract of land, or farm, belonging to the State, will make a good showing this year, the following number of acres being devoted to the various crops, all of which are growing finely, although backward: —

Grass, 123 acres; corn, 16; potatoes, 18; oats, 5; rye, 4; beets, 1; vineyard, 2; young orchard, 3; nursery, 1¾; vegetable garden, 1¾; small fruits, 1¼. The only piece newly drained, this year, is one of about four acres near Professor Stockbridge's house, where two-inch pipe has been laid in drains 30 feet apart, and from three to five feet deep, at a cost of about $1 per rod. The 12-acre piece of swamp-land taken up and seeded last year by Farmer Dillon, at a cost of about $35 per acre, is now covered with grass that promises two tons of hay per acre this year, with the probability of a larger crop next. There are now seven horses kept on the farm and 42 head of cattle, divided among the Ayrshire, Shorthorn, Jersey, Dutch, and Brittany breeds. Though Farmer Dillon does n't brag of his stock very much, he shows an Ayrshire and Shorthorn that have averaged 18 quarts of milk each, daily, since January 1. Having passed the years of preparation, when the waste lands had to be reclaimed and much work done that showed no immediate return, the farm is now bearing the fruit of that labor, and shows larger and larger crops, yearly. The first year that Farmer Dillon was here, some five or six years since, he had to buy hay to carry the stock through the winter; but last year, with as much stock, he sold as much hay as he used. There is no longer any question about the farm department's proving a financial success.

The Durfee plant-house and horticultural department, under charge of S. T. Maynard, of the class of 1873, is also flourishing very finely. Considerable revenue is obtained from the sale of flowers and young plants. A gift of a choice collection of herbaceous shrubs and trees from Professor Sargent, of the Bussey Institute, is the chief addition of the year. The fruit orchard promises finely, the peaches especially so. An experiment of last year, when one potato of each of 87 different varieties was planted, is being repeated with over 90 varieties, including most of those grown last year. The largest yield then was by the Campbell Late Rose, which gave 40 pounds from one tuber. D. P. Penhallow, of the last class, is also experimenting with the seeds of the "lifting squash," which acquired notoriety last year, in lifting 5000 pounds. He hopes to raise some mammoths from these seeds, letting them grow unconfined. The mercurial gauge will be applied to the vines as soon as practicable. President Clark, having finished his experiments with the pressure of sap and the growth of plants, is now devoting himself especially to finding out the chemical constituents of the colors of plant growth.

THE CURRANT WORM.

The antagonism so generally felt by all cultivators to this hateful pest is my reason for believing that this contribution will not prove unacceptable to you and some of the readers of your Journal. Now in my seventy-second year, yet I am only a recent amateur in the cultivation of the currant and other fruits. But this investigation has been persisted in for the space of eight years, until I am perfectly satisfied that what is here stated will be found true by all who may persevere in this investigation as I have done.

What we want, for a successful fight against any or all the destructive insects, is to find them tangible in one of their multifarious transformations, where we can the most easily arrest their evolutions. Now, if I have not discovered this point in regard to the currant worm, I think it may be said that I have approached somewhat in the right direction. It is immaterial at what stage we begin; we must follow the insect in each of its revolving states; so that if we can arrest it completely in one of its three or four or a dozen phases, its utter annihilation is made sure. I wish, indeed, that I could say that I felt as sure of the canker worm, the squash bug, and the curculio, as I do of the currant worm.

Let us now see if we can discover the place, and perhaps the best we can find, for an effectual fight with this pest. As we go over the currant bushes in May, after the new growth has got well under way, we notice that some of the new stems have been squarely cut off, so that a few inches of the top hangs to the bark, or has fallen to the ground. The cut appears recent, as if done the night before. Now, this cut has been made by the same currant worm in one of its forms as a fly; and it was done for the purpose of depositing an egg on the top of the place cut off. And by giving attention to that cut end, the currant and gooseberry worm may be annihilated. From that egg there comes the borer, which, if not arrested, bores down the stem eight or ten inches, and after having been frozen solid, the following spring it becomes the fly which lays its eggs on the under side of the leaves, and from which we have the worms against which the fighting has hitherto been done. But, manifestly, this fight can never annihilate these worms, because it is never possible to destroy the whole of them in any given case. But it is possible to notice each one of the cut stems, and so to prevent the egg from becoming a borer.

It has long been an unsettled problem as to what becomes the status of these worms after they have fulfilled their "mission" in eating up the leaves. Here are my own conclusions on this point, and the demonstration by which they are supported.

On some of the leaves, with these green feeders, may often be found also a white worm, that does

not feed at all. Noticing the *skins* of the green worms, with head and legs precisely as if some of them had moulted into another form, suggested to me that probably these white larvæ had moulted from some of the others. I therefore placed a few leaves with only the green worms on them in a glass jar which is now before me. This morning, sixteen hours after, on looking into this jar I discovered three of these white worms on the leaves, with the skins from which they had moulted. This process of moulting is seemingly gone through with in a single night. But only a small proportion (perhaps the lighter colored ones) moult, and so their cycle is completed. As with the honey-bee we know that the "workers" constitute by far the largest proportion of the three classes in the swarm, and yet these workers do not propagate; so with these destructive workers on the currant bush. It does not appear that the greatest proportion of them moult or propagate; but the purpose in the cycle is secured without this.

These white worms are always found on leaves where the skins may be found, from which they have moulted. And those that do not moult, dry up and die upon the leaf. They do not fall to the ground, as some have supposed. The white worms are inactive, and never seem to feed. When touched they instantly curl up, and wriggle to the ground. Whether they remain till spring in the earth, or make their cocoons above ground, is unknown. But it would seem highly probable that it is from these white larvæ that the flies come which announce their presence in the spring by insidiously cutting off the new growth of the shrub, as I have stated. At any rate, by persistent attention to these cut-off ends in the spring, the currant worm may be annihilated. Every cut can be noticed and numbered, a remark that could not be truly made of any other pest, certainly not of the potato bug, the curculio, or the "hopper" of the West. And hence I affirm that in any locality where all having currant bushes shall agree to follow up this method, these worms must become a thing of the past.

These cut-off ends are flat, and a piece should be clipt off with a sharp knife, and above the axil of a leaf, in a sloping or upward direction, so as to facilitate the continued growth, and also to distinguish it from any not thus treated. If not attended to till late in the fall, these cut-off stems will be found dead, and should then be cut away and all of them be destroyed.

The first week in July, the present season, I have taken off some dozens of these cut ends, in each of which I have found the small borer, and some so very small as only to be seen by the microscope. By an early removal of this cut end, the wood is saved, while its borer, the fly, and the worms, are forestalled. Thus it will be seen, in this circle of insect life, we have two different flies, one borer, and two different worms, all having one purpose, which is the destruction of the currant and the gooseberry.

Last fall I cut out all these dead stems I could find, and in them I found this full grown borer, and in some a number of small ones. This precaution made far less work for me in the fight of these worms the present season. I may perhaps add that my labors in this regard would have been very light indeed but for the gardens of my neighbors. For it is patent that dusting these worms with white hellebore, air-slacked lime, etc., does but slightly check their increase, if it does at all, from year to year. If we were to destroy all the "workers" from a swarm of bees, this would not cut off all possibility of increase from the two classes that survive. But I am sure that no garden, attended to as I have here suggested, could have a currant worm in it the following year, unless indeed the insidious fly should come from some other place. So much for the currant worm. But I have discovered the present season another destructive creature at work upon my currant and gooseberry bushes. It is a real borer, boring from the outside into the new wood, which soon dies. It is lively, quick moving, and half an inch in length, black, with white stripes lengthwise, three at each end, and one over the middle. This is a new enemy in this locality, and of its pedigree nothing is at present known.

LaRoy Sunderland.

Quincy, Mass., *July* 7, 1875.

BREVITIES.

On Naming Flowers for Persons. — The *Pall Mall Gazette* remarks: "The practice of naming flowers after private friends or public characters is very pretty; but it may be suggested that a little care in the selection of epithets bestowed on such names would not be amiss. Otherwise it is difficult to say whether poetical compliment or covert satire of the sponsor is intended. What shall we say, for instance, of the descriptions appended to the names given to three new roses, just 'sent out' by a leading nurseryman, which we find in the advertising pages of last week's gardening papers? First shall come a lady, and, if the language is rather glowing, we trust that it is not on the whole displeasing to the fair prototype: —

"Miss Hassard. — Beautiful delicate pinkish flesh color, large, full, and fine form, very sweetly scented. First-class for either exhibition or general purposes.

"But the next is so ludicrously inappropriate that we only reproduce it in the assurance that the original bearer of the name would have smiled at the incongruity of the epithets: —

"John Stuart Mill. — Bright clear red, large, full, and beautiful form, of great substance; well adapted for exhibition purposes, being also of strong constitution and free habit. Quite distinct.

"Last comes a clergyman, himself a distinguished rosarian, and we hope his parishioners recognize the portrait: —

"Revd. J. B. M. Camm. — Very bright rosy pink, most pleasing color, large, very full, and fine globular form; very sweet, constant, and thoroughly distinct; growth vigorous.

"The moral touch, 'very sweet and constant,' is peculiarly appropriate to a clergyman, and will perhaps reconcile his admirers to the allusion to what some might deem the physical defects of a rosy pink complexion and too globular form."

The Value of Farm Products. — The last volume of the Agricultural Report contains the following table, which shows the cash value of farm products per acre in the several States and in the Territories: —

States.	Average Value per Acre.	States.	Average Value per Acre.
Maine	$14.16	Texas	$12.84
New Hampshire	19.15	Arkansas	17.60
Vermont	17.87	Tennessee	12.70
Massachusetts	31.10	West Virginia	15.04
Rhode Island	34.00	Kentucky	15.54
Connecticut	33.94	Ohio	14.57
New York	22.94	Michigan	15.65
New Jersey	27.96	Indiana	13.51
Pennsylvania	20.80	Illinois	11.13
Delaware	13.24	Wisconsin	14.18
Maryland	15.42	Minnesota	11.38
Virginia	14.15	Iowa	8.49
North Carolina	11.38	Missouri	11.99
South Carolina	10.45	Kansas	8.92
Georgia	11.68	Nebraska	7.73
Florida	11.47	California	15.10
Alabama	13.78	Oregon	16.70
Mississippi	15.61	Nevada	44.30
Louisiana	15.61	The Territories	26.10

Counting out Nevada, whose exceptionally high rate is explainable probably by local and temporary reasons, the highest value in the above list is Rhode Island, the next highest Connecticut, and the next Massachusetts. As the *New York Evening Post* remarks, this looks as if agriculture in New England were not quite the losing business it is sometimes represented to be.

Boston Journal of Chemistry.

Jas. R. Nichols, M. D., *Editor.*
Wm. J. Rolfe, A. M., *Associate Editor.*

BOSTON, AUGUST 1, 1875.

MEETING OF THE PHARMACEUTICAL ASSOCIATION.

A great degree of interest is manifested by the druggists and others of Boston in the approaching meeting of the American Pharmaceutical Association, which occurs here the second week in September. The large sum of $6500 has been subscribed to defray the expenses of the meeting and the various entertainments projected. It should be distinctly understood by the gentlemen of the association that they are to be entertained by the druggists, chemists, and medicine dealers of the city, and not by any pharmaceutical society or organization. The reception is designed to be complimentary to the druggists of the country as gentlemen and business men, without much regard to the "pharmical" aspects of the visit. The practical, well-informed druggists of the country are quite willing to leave the learned discussions and papers to a dozen more or less of their associates, while they betake themselves to healthful recreation and sight-seeing, and they will find their time fully occupied.

The general plan of entertainment is: A levee, with ladies, at the St. James Hotel, Tuesday evening, with supper and music; Wednesday morning, a ride to the suburbs for the ladies, with a lunch on the route; Wednesday evening, promenade concert at Odd Fellows' Hall; Thursday evening, free tickets to the theatres, etc.; Friday, harbor excursion, dinner at Rockland House and on the boat, with music and dancing. It is also proposed to have a lunch at the hall every day at noon. The attendance of visiting members will be about as usual, with probably more than usual from New York and Philadelphia. The Boston druggists will turn out strong, and many will join the association. It is proposed to have excursions to the White Mountains and other places after the adjournment.

ALLEGED DISCOVERY OF A NEW MOTOR.

The newspapers of the country have recently contained notices of a new and marvellous motive power, produced by the "joint action of air and water," discovered by a Mr. Keely. Several correspondents inquire if this alleged new discovery is probably of any practical value, if the claims set up have any foundation in truth. We think not. It is doubtless another scheme like that originated by Paine, of Worcester, twenty-five years ago. Mr. Paine succeeded in keeping the whole country excited for months, by publishing statements that he had discovered a new method of decomposing water and producing therefrom a cheap and brilliant light. But his light went out in darkness, and we have no doubt the "Keely motor" will soon stop rotating and the dupes of his "enterprise" will suffer great disappointment. Keely is alleged to have made the following statement, which is enough of itself to show him to be a charlatan of the first water: "I have produced the results which many persons have seen, in the precise manner

heretofore stated, to wit: the introduction of atmospheric air into my machine, a limited quantity of natural water direct from a hydrant at no greater than the ordinary hydrant pressure, and the machine itself, which is simply a mechanical structure. With these three agents alone, unaided by any and every chemical compound, heat, electricity, or galvanic action, I have produced in an inappreciable period of time, by a simple manipulation of the machine, a vaporic substance at one expulsion of a volume of ten gallons, having an elastic energy of ten thousand pounds to the square inch."

A COFFIN SHOW.

The London public has been treated to some novelties in the way of exhibitions, like the cat shows and dog shows at the Crystal Palace, but it had a "new sensation" on the 15th of June in the exhibition of "perishable coffins" made on the principle advocated by Mr. Seymour Haden. The show was held in the garden of Stafford House, and attracted much attention. The coffins were simply wicker baskets, of the ordinary coffin shape and of various sizes. Two of them had their meshes filled with moss, but the rest were left with the meshes open, like those of an ordinary waste-paper basket. Two or three were double, with a space 2 in. or 3 in. in width between the inner and the outer basket; and this space is intended to be filled with charcoal, for cases in which any precaution against infection and decomposition may be required. Mr. Seymour Haden was himself present, and was eagerly questioned about many details of his plan, but the following handbill, which was given to each visitor on entrance, contains all the necessary explanation: —

"It is necessary, perhaps, to explain that the models shown are merely suggestive, and that the majority of them do not as yet fulfil all the conditions essential to their practical use. 1. The mesh in most of them should be larger than it is, and as open as is consistent with strength and the perfect retention of their contents, which contents, again, should consist of the larger ferns, mosses, lichens, herbs, fragrant shrubs, and any of the coniferæ, willows, or evergreens, which are always to be had. 2. The osiers composing the baskets should be light (two thin ones being better than one thick one), and no more solid wood should enter into their construction than is necessary to preserve their form. 3. They should be of white or stained willow, without varnish or other preservative covering. 4. Accompanying each of them should be a narrow leaden band or ribbon, pierced with name and date of death, to be passed round the chest and lower limbs, and through the sides, and over the top of the basket: (i) for retaining the body in its position; (ii) for the subsequent identification of the bones; (iii) for sealing the coffin, as a guarantee that the contents have not been disturbed. 5. In special cases linings of some imperishable material for a few inches upwards from the bottom will be necessary; and, in other cases, such modifications of the ordinary form as may insure a complete inclusion of the body in wool, charcoal, or other disinfectants. 6. Other materials which are light, strong, perishable, inexpensive, adapted for carriage, and favorable to the dissolution of the body, may do as well and possibly better than these wicker baskets. Readiness of carriage, and the insurance of resolution being the main objects aimed at, several such materials do, in fact, suggest themselves, and may afterwards come to be employed."

WEEDS AS WATER PURIFIERS.

It is pleasant, if only for the sake of variety, to be able to say a good word for weeds, as Mr. J. J. Mechi does in the following communication to the London *Agricultural Gazette*: —

Into my pond runs a stream, of 25 gallons per minute, of pure water from a drain which I cut 12 feet deep some 30 odd years ago. Weeds will grow and thrive in this pond, and we have annually to rake out large quantities of them. They look very beautiful as they grow in the pellucid water, which is used for household purposes. Said a visitor to me one day, "If you had a pair of swans your pond would be free of weeds;" so a kind friend presented me with a pair, and very soon they cleared the pond, pulling the weeds up by the roots and feeding on them. My family were delighted with the graceful swans and the removal of weedy obstructions to boating; but although the pond was free of weeds, the water was no longer pure and pellucid, but most decidedly muddy in taste, and when the steam issued from the kettle, the smell of mud was unmistakable. Well, no one thought it could be the swans, but at last I came to that conclusion, and, despite family and other remonstrances, returned them to their original owner. After a short period the weeds reappeared, and, as they increased in bulk, the water gradually assumed its pellucidity and purity, and "Richard was himself again." What the weeds do for the water and its occupants the land vegetation does for the air; men, animals, and other living creatures poison it, while vegetation absorbs the injurious gases, and reconverts them into wholesome food and fuel for man and beast, filling the atmosphere with that precious oxygen without which men and animals and other living creatures could no longer exist. So it is in the vast ocean, whose living occupants and vegetation probably exceed in quantity that which is on land. We owe to the river vegetation much of the purity of water. It is the excess of impurities from our towns which are beyond its powers of appropriation.

EDITORIAL NOTES.

An Unsophisticated People. — We find in English journals recent reports from the Challenger expedition, which, at last accounts, was cruising in the vicinity of Japan. A visit had been paid to the Admiralty Islands, the inhabitants of which have had so little intercourse with the outside world that they are totally ignorant of the use of either tobacco or spirits. They are described as remarkably honest for savages, and do not show that distrust of civilized man which unsophisticated races soon learn when they get better acquainted with him. They are tasteful in their dwellings and utensils, carefully lay the roads between these dwellings with clean coral sand, and cultivate flowers. On one point, however, their observing visitors were nonplussed. Their hosts were mortal men, but there was no sign of graves or grave-yards anywhere. Curiosity was aroused. "We," says the writer, "found out the word for 'dead;' they are very effective pantomimists, and when we inquired what became of the bodies, they made the most unequivocal signs that they cut them in pieces, boiled, and ate them." While, however, indicating that they were quite willing to eat one another or even their guests, they expressed abhorrence of cooked dog.

Legal Fishes. — Our readers have seen in the daily papers that the Brighton Aquarium has been fined for being kept open on Sunday, though the English laws, with admirable consistency, allow drinking-shops to do their regular business on that sacred day. The zoölogical "rulings" of the court seem to have been on a par with the legal ones, for, according to the *Pall Mall Gazette*, "the Solicitor-General calmly spoke of seals as fish, and the judges, to say the least, did not put him right. If one said that the popular mind was at sea on the subject, the metaphor would be open to the objection that a mind that is at sea ought to get clearer notions of the creatures which live in the sea. But when a seal is publicly called a fish in a grave judicial proceeding, it is hard to keep down one's feelings of sympathy for a maligned fellow-mammal. Perhaps some confusion on the subject of fishes and other inhabitants of the deep may have been caused by the choice of examples in the Eton Latin grammar, 'Piscium, ut ostrea, cetus,' where two creatures are picked out as specimens of fishes which no zoölogist would allow to be called fishes. To be called a fish is doubtless promotion for an invetebrate oyster, but it is dishonor for a warm-blooded, viviparous whale. And how much more dishonor for a seal, which, as one of the *Carnaria*, ranks higher again; and specially for seals of such a high degree of intelligence as those spoken of by the Solicitor-General. A lawyer might have argued that, however unlawful it might be to look at fishes, it did not therefore follow that it was unlawful to look at seals. Some years back a police magistrate showed a degree of ignorance of natural history more to be regretted in its consequences, though hardly worse from the scientific side. He declined to do anything in a case of cruelty to a bird, because it was only cruelty to animals that was forbidden, and he could not look on a bird as an animal. Probably a good many birds were worse off for such a decision. Nobody is likely to do any harm to the seals on the ground that they are fishes, and therefore not animals; but it is hardly unreasonable to expect that judges and solicitors-general should at least have mastered enough of natural science to save them from thrusting down a mammal and a brother into the ranks of cold-blooded creatures devoid of all family ties and human affections."

Railway Accidents in England. — The returns relating to railway accidents in Great Britain for last year have just been published, and the following abstract from an English journal may interest our readers: "The total number of persons reported as killed in 1874 was 1425, and injured, 5050. Of the killed, England contributed 1175; Scotland, 211; and Ireland, 39. Of the injured, the numbers for England are 4468; Scotland, 496; and Ireland, 86. It further appears that there were last year in the United Kingdom, to account for all this killing and wounding, 55 collisions between passenger trains or parts of passenger trains; 183 collisions between passenger trains and goods or mineral trains, engines, and vehicles standing foul of the line; 75 collisions between goods trains or parts of goods trains; 6 collisions between two engines; 97 accidents from passenger trains or parts of passenger trains leaving the rails; 74 from goods trains or parts of goods trains, engines, etc., performing the same feat; 40 from trains or engines travelling in the wrong direction through points; 21 from trains running into stations or sidings at too high a speed; 195 from trains running over cattle or other obstructions on the line; 52 from trains running through gates at level crossings; 6 from the bursting of boilers, etc., of engines; 8 from the failure of machinery, springs, etc., of engines; from failure of tyres, 55; ditto of wheels, 13; of axles, 229; of brake apparatus, 1; of couplings, 23; of ropes used in working inclines, 3; of tunnels, bridges, etc., 4; 493 are charged to broken rails; 10 to blocking of portions of permanent way; 8 to slips in cuttings or embankments; 28 to fire in trains; 12 to fire at stations, or involving injury to bridges or viaducts; 11 are returned as 'other accidents.' Directors hanged or imprisoned for manslaughter, 0."

Messages from the Sea. — Mr. Garside, of Southport, describes, in the *Pharmaceutical Journal* of the 19th instant, the method he successfully em-

ployed for restoring the legibility of a letter which had been submerged in the wreck of the Schiller, and which was quite illegible until submitted to the process described. The letter was carefully brushed over with solution of sulphocyanide of potassium (one in twenty), and then, still damp, held over a dish containing hot hydrochloric acid. The writing was thus developed of a deep red color. The *rationale* of the process is this: The iron of the ink is precipitated as peroxide upon the fibres of the paper, and remains when all other coloring matters are washed away. Being in an insoluble form, however, no effect is produced by the reagent until the fumes of the acid have rendered it soluble.

A German Exhibition in 1876. — We know of no important international exhibition in Europe next year that can compete with our Philadelphia "Centennial;" but there is to be an interesting show at Munich during the summer, namely, a "General German Art and Industrial Exhibition," to commemorate the twenty-fifth jubilee of the Art Association of Bavaria. The exhibition will include the works of old as well as modern masters, and circulars have been addressed to a large number of the leading artists and manufacturers in Germany, inviting them to send in contributions. The King of Bavaria has informed the president of the association, Herr Ferdinand von Miller, director of the Royal Bronze Foundry at Munich, that as patron of the exhibition he will contribute a sum of 10,000 florins towards its expenses, in the hope that the undertaking may tend to the promotion of a higher state of development in the cultivation of art, and to a better and more correct appreciation of artistic products.

ATOMS.

There were nearly nine million pounds of copper exported from this country to Europe last year. — A hundred years ago it was a common thing for persons to call on their physicians to be bled; and Sir Cæsar Hawkins, of London, who retired from practice about 1777, is said to have made a thousand guineas per annum (more than five thousand dollars) by his lancet alone. — Four parts borax and three parts Epsom salts, mixed with three or four parts warm water to one part of the combined substances, is said to form an excellent fire-proof wash for clothes; it should be used immediately after preparation. — The General Medical Council of Great Britain, having been asked by the government their opinion as to whether women ought to be registered as practitioners of medicine, appointed a committee to consider the subject, who report that while the practice of medicine presents many special difficulties for women which cannot safely be disregarded, they are not prepared to say that women should be excluded from the profession, but they believe that the education of women as physicians ought always to be conducted in separate schools, though the course of education and examination should not in any respect differ from that of men; and this report, after a long debate, has been adopted by a two thirds vote of the council. — The Bessemer and the Castalia, the rival Channel steamers, are at present in the Millwall Docks, and are likely to remain there for some months; indeed, the prevalent opinion now seems to be that they are both failures, though possibly not hopeless ones. — Professor D'Arrest, of the University of Copenhagen, who died in that city on the 14th of June, was one of the most eminent of European astronomers, and especially notable of late for his examination of the nebulæ by means of spectrum analysis. — At a recent trial of brakes before the railway commission in England, the Westinghouse air-brake gave the best results throughout a long series of varied experiments; but the official report of the investigation has not yet appeared. — In Clifton, the beautiful suburb of Bristol, England, during the week ending June 19th, there was only one death in a population of 28,749, or at the rate of 1.8 per 1000 per annum. — A new and improved poultice, invented in France, consists of two layers of wadding saturated with a solution of *Fucus crispus*, pressed and dried, so that it resembles cardboard; when required for use it is soaked in hot water, and becomes soft and spongy. — We know of no more interesting or more valuable "centennial" literature than the series of papers on "The First Century of the Republic," now in course of publication in *Harper's Magazine*. — Claude Bernard made the important discovery (which has been utilized in various surgical cases to obtain prolonged anæsthesia) that when the sleep produced by chloroform has continued a long time, and it is feared to administer more chloroform, the injection of a little morphine under the skin prolongs the anæsthetic state considerably, and without evil results; on the other hand, if morphine be injected first, a much smaller dose of chloroform suffices to produce insensibility, but as soon as the inhalation ceases, sensibility returns. — A woman ninety years old, at the Hospital of Incurables in Paris, has "cut" a complete fourth set of teeth; the third set having appeared at the age of sixty-three, and the second at forty-seven. — Some of the papers are reporting the "recent" sale of the manuscript of Gray's Elegy for £100; the fact being that *that* sale was in 1845, and that it was sold again in 1854 for £131, and again this year for £230 ($1150, probably the largest sum ever received for a single sheet of paper), if the statement given in London journals is to be depended upon. — Dr. Isidor Walz's important "Contributions to the Theory of Solubility," which appeared in the *American Chemist* for February, 1875, have been reprinted in a neat pamphlet. — Henry Life, M. D., of McEwensville, Pa., has published in pamphlet form his interesting treatise on "The Science of the Tides," in which he propounds a new theory of the phenomena, and claims that he has proved its truth experimentally. — An interesting lecture by Dr. Brown-Séquard on some new views concerning the localization of the functions of the brain will appear in an early number of the *Boston Medical and Surgical Journal;* and other important articles are announced, including one on the treatment of typhoid fever by cold water, by Professor R. T. Edes, and one on the non-restraint method adopted for the treatment of the insane at Dr. Fraser's Asylum in England. — The gardener of Earl Brownlow, in England, has raised a bunch of bananas weighing eighty pounds, but this was surpassed by one exhibited before the Horticultural Society in 1843, raised at Leigh Park, and weighing one hundred and twenty-nine pounds. — The New Orleans and Mobile Railroad Company has recently purchased 10,000 barrels of creosote oil, to be used for the protection of their bridge timbers and piling against the attacks of the marine worm, the *Teredo navalis*, which is so destructive to timber on the south Atlantic and Gulf coasts that piling is frequently rendered entirely worthless in the space of eighteen months. — The London *Garden* says it can give no advice to "the gentleman who writes that the birds have built in the pocket of one of his scarecrows." — A correspondent of the *Academy* writes from Ober-Ammergau that the group of the Crucifixion in stone, ordered by the King of Bavaria, will shortly be erected on the mound above the stage on which the Passion play is performed, and that the inhabitants mean, on the occasion of the inauguration festival, to put the "School of the Cross" on the stage, a performance in which about two hundred persons take part. — The annual excursion of the Massachusetts Press Association, which took place just after our last number went to press, and which included a jaunt to Watkins Glen and Niagara, was heartily enjoyed by the hundred or so gentlemen and ladies who made up the party; but it has been so fully described by many of our contemporaries who did not have to wait a whole month before doing it, that any extended notice of it now would be stale and superfluous. — A writer in a Belgian journal says that he has successfully kept a marine aquarium for nearly ten years without renewing the sea-water in it; all that he does being to add fresh water as the salt water evaporates, the same degree of saltness being invariably maintained. — Mr. Ellis Lever, of Manchester, England, who bought the magnificent estate of Manley Hall, at the auction sale not long ago, offered the property to the city for the same sum he had paid for it, with a gift of £20,000 ($100,000) towards making a public garden of it, and the gift was declined; but the plan is likely to be carried out by private subscription.

LITERARY NOTES.

The Appletons have just published *Breakfast, Dinner, and Tea*, a new edition of a book which first appeared some fifteen years ago. It is not a mere cook-book, though it contains some three hundred culinary recipes, but a curious and entertaining medley of matters, historical, poetical, and practical, connected with the kitchen and the table. It might be called a popular encyclopædia of gastronomy.

The same house have become the American publishers of the new series of "History Primers," which are uniform in size and shape with the "Science Primers," already so successful. The *Greek History*, by C. A. Fyffe, sold for half a dollar, and containing about a hundred and fifty small pages, is nevertheless a model epitome of the subject, and would doubtless be accepted as covering the requirements for admission to Harvard. Other histories are soon to follow.

Tennyson's new drama, *Queen Mary*, has been reprinted by Osgood & Co., and is greatly in demand, as it has been in England. The critics there are at variance as to its merits, some ranking it above Shakespeare's "Henry the Eighth," others setting it down as an utter failure. The final verdict will probably be about half-way between these extremes, or perhaps somewhat better than that.

Exotics (Osgood & Co.), a little volume of translations from German, Latin, etc., by J. F. C. and L. C. (Rev. J. Freeman Clarke and Miss Lilian Clarke, as is well known), is unquestionably much above the average of versified translations, and some of the poems are faultless reproductions of the sentiment and the melody of the originals. It will be found a pleasant summer companion for people of culture and taste.

The popularity of the *Little Classics* has led Osgood & Co. to add two volumes of *Poems* to the dozen of prose already issued. The selections, judging by the first volume, are made with the same good taste that has characterized the series from the first. They are dainty little books, both internally and externally, and as cheap as they are pretty.

Practical Hints on the Selection and Use of the Microscope, by Prof. John Phin, editor of the "Technologist," is all that could be desired as a manual for beginners, for whom it is intended. It is published by the Industrial Publication Company, 176 Broadway, New York, and costs only 75 cents, prepaid by mail.

Popular Resorts, and How to Reach them, edited and published by Mr. John D. Bachelder, has just been issued for the season of 1875. It is not a guide-book, but something better — an illustrated gazetteer of pleasure travel in the United States. It gives the information the tourist wants, and is also an attractive and entertaining book for home reading.

Niagara, an illustrated account of its history and geology, incidents and poetry, by Geo. W. Holley (Sheldon & Co.) is the best guide we have seen for visitors to the cataract, or for the general reader. It has reached a second edition, which is evidence that its merits are not unappreciated.

A new juvenile magazine has been started by D. Lothrop & Co., of Boston, under the title of *Wide Awake*, and the first two numbers are so good, in every respect, that we believe it will escape being swallowed up by "St. Nicholas," with which, considering its price, it will compare not unfavorably. Indeed, at two dollars a year it is marvellously cheap, and the liberal outlay of the publishers can be reimbursed only by a large circulation. This, however, it is pretty sure to gain, for it will commend itself at sight to the juvenile public.

The Young People's Magazine, which we have before commended, has been added to our "Clubbing List," and will be furnished *with the* Journal for two dollars a year, both prepaid by mail.

The July number of the *Official Postal Guide* (H. O. Houghton & Co.) contains much new matter, including the rates of foreign postage as fixed by the international treaty, recent rulings of the department, etc. Stamp collectors will be interested in the arrangements for furnishing sets of specimen stamps, of present and former issues. This useful quarterly costs only 50 cents a number, or $1.50 a year.

Medicine and Pharmacy.

ALCOHOL: ITS ACTION AND USES.

IV.

Dr. Richardson's fifth lecture was "On the Secondary Action of Alcohol on the Animal Functions, and on the Physiological Deteriorations of Structure incident to its Excessive Use." He said that it was his business in this course of lectures to treat upon the specific action of absolute alcohol. He had therefore specially avoided all reference to the spirituous drinks of which it forms a part. But he wished it to be understood that the source of the action in every strong drink was the spirit it contained; and that if all the liquors sold under the name of wine, brandy, gin, rum, whiskey, ale, stout, perry, cider, and so forth, were divested of their alcoholic spirit, they would contain comparatively little of anything that would affect those who partook of them. It was but fair, however, to admit that some bad effects do spring from wine and kindred drinks independently of the pure spirit they contain, and that something less of evil than now exists would result if none but natural wines and ales were drunk by the people. "At the present time the characters of pure ethylic alcohol are scarcely known."

A *bona-fide* wine derived from the fermentation of the grape purely could not contain more than seventeen per cent. of alcohol; yet our staple wines, by an artificial process of fortifying and brandying, are brought up in sherries to twenty and in ports to even twenty-five per cent. Many wines and spirits are charged with amylic alcohol. Other wines are charged with foreign volatile substances to impart what is called bouquet, and still other so-called wines (especially the effervescing liquids sold under that name) are actually often undergoing the fermenting process at the time they are drunk, and thus are invited to complete their fermentation in the stomach.

The admitted addition of some actively poisonous substance to alcoholic drinks, in order to produce a new luxury, is a still more disastrous evil. This was illustrated by absinthe, the effects of which resemble those of haschish, the narcotic of the East, which has been known for so many ages as the nepenthe of Homer, and which owes its properties to the presence of extract of Indian hemp, or *Cannabis indica*. Dr. Decaisne is right in maintaining that the use of absinthe as an article for human consumption ought to be legally forbidden in all civilized communities.

The lecturer said that the practice of adulteration the least hurtful was that which was carried on in ales; such was at any rate his own opinion of the ales sold in London, and he spoke from a practical knowledge of the facts. He said that he had never found a dangerous ingredient present in any single instance. The grand adulteration was water. There was a prevailing notion that to malt liquors bitter substances, such as strychnine, or narcotic substances, such as *Cocculus indicus*, are added. It is urged that there is no known application for the quantity of *Cocculus indicus* that is sold, except it be for the adulteration of malt liquors. He would not dispute the matter, but content himself with stating that he had never himself detected any foreign body of the kind, and that in the whole of his experience of the effect of malt liquor on man, he had never known a symptom produced indicative of the effect of such substances. The stronger ales and stouts are injurious mainly from the alcohol they contain.

Dr. Richardson then went on to speak of wines and spirits, and the various substances present in them as impurities, or in vogue as adulterants; but as this is a subject which has already been fully discussed in the Journal, we will not dwell on this portion of the lecture.

The phenomena of chronic intoxication from alcohol were next considered. In the early stage this agent produces arterial relaxation, upon which follows extreme cardiac sensitiveness. The circulation is consequently quickened, and deteriorations of structure follow. On this point it was argued that by its continued contact with the colloidal tissues alcohol must injure them, inasmuch as there are very definite changes produced by its action on blood corpuscles and other textures out of the body.

In the sixth and concluding lecture, the subject of the deteriorations of structure caused by alcohol was continued, and its influence on the vital functions, and the mental phenomena induced by its use, were considered. All membranous tissues are colloidal structures, and all the vital organs are enveloped by such textures. The food we assimilate becomes colloidal in the blood. Upon all membranous tissue alcohol exerts a perverting action, giving rise to thickening, shrinking, and consequent inactivity of function. This arises from the alcohol depriving them of water. A series of changes are thereby induced analogous to those observed in acute alcoholic poisoning. At an early period the emotional centres are affected; hence the alternate exhilaration and depression so frequently observed in those who indulge in stimulants. In such cases the vessels of the brain, lungs, liver, stomach, and kidneys are all distended. The stomach is particularly apt to suffer, as it is exposed to the direct action of the agent in its most concentrated form. Alcoholic dyspepsia is therefore only too common, and it is the worst form of indigestion.

From this Dr. Richardson passed to the nervous derangements of chronic alcoholism, and attributed these to the effect of the fluid on the neurilemma, the perverted condition of which might give rise to pressure within the sheath. He traced neuralgia, sciatica, etc., to this cause. Another nervous affection was alcoholic insomnia, which he attributed to the injured state of the cerebral vessels, and the unnatural tension to which they are subjected by the increased heat of the heart.

The organic lesions of the liver and kidneys, so well known as the results of drinking, were briefly considered; and it was then shown that the lungs do not escape, in proof of which Dr. Richardson described at length alcoholic phthisis, which, now generally recognized, he was the first to differentiate. Other organic lesions were mentioned, as those of the heart and great vessels, of the eyeball, of the brain and spinal cord, and a similar explanation was offered of the various changes observed.

The lecturer concluded by turning from the purely physical action of alcohol to its influence on the mental functions. One of the earliest effects noticed is loss of memory, which is often followed by impairment of volition. This is marked by failure of speech, which indicates the approach of general paralysis. Our lunatic asylums are full of such cases. In explanation of them Dr. Richardson said that "the membranes of the nervous centres of thought and volition have lost the dialyzing function. In some instances, though less frequently than might be supposed, the nervous matter itself is modified visibly in texture."

A few words were added on dipsomania, and on *mania a potu*, after which this course of lectures was brought to a close by an allusion to "the solemnest fact of all," namely, that the mischief inflicted on man by his own act is transmitted to his descendants. Not one hereditary wrong, physical or mental, is more surely passed on to unborn generations than the ills wrought by alcohol. Let Dr. Richardson conclude his argument in his own words: "If this agent do really for the moment cheer the weary, and impart a flush of transient pleasure to the unwearied who crave for mirth, its influence (doubtful even in these modest and moderate degrees) is an infinitesimal advantage by the side of an infinity of evil for which there is no compensation and no human cure."

A CASE OF CARBUNCLE TREATED BY SUBCUTANEOUS INCISIONS.

BY E. CUTTER, M. D.

Mr. N. C., twenty-one years of age, farmer, on the 6th of June, 1865, sought medical advice with the following symptoms: general malaise, loss of appetite, slight chill, inability to labor, great pain in the back near the region of the sacrum, where there were found some small pustules cropping out. A course of evacuant and tonic treatment was instituted, with poultices charged with laudanum. The case however grew worse; the pustules developed into large, elevated, angry, leaden-colored prominences, which subsequently sloughed out, leaving a congeries of foramina clustered over the upper part of the sacrum. The adjacent tissues were swelled, livid, punky, and painful even to the tip of the coccyx. It appeared June 16th as if a space of the size of the palm of one's hand would entirely slough out. At this stage it occurred to me to put to the test the treatment by subcutaneous incisions recommended by a distinguished practitioner of London in 1862. Accordingly the peripheral parts of the swelling were frozen with ether spray, and successively punctured with a tenotome, the knife being swept around in nearly a semicircle in each instance, freely dividing the subcutaneous bands that cross the substance of a carbuncle. This operation was painful and bloody. It was attended with an immediate subsidence of the swelling, and an improvement in the color of the inflamed skin. It was then poulticed as before. Next day there was a marked improvement in the upper part of the carbuncle. The swelling had subsided to the level of the healthy skin. The feel was more normal. The hue was lighter. But towards the lower part the swelling had increased. It felt elastic and yielding, as if matter was below. This portion was freely subcutaneously divided. No pus flowed. The next day witnessed a marked improvement in the symptoms, and from this time the convalescence was rapid and satisfactory. There was no sloughing of the integument, but a speedy return to the elasticity and feel of health.

Remarks. From experience the writer feels convinced that with the ordinary crucial incision and caustic potash there would have been a large raucous ulceration from actual loss of cutaneous tissues. He believes that the timely and free incisions of the subcutaneous areolar tissues acted as a direct local

antiphlogistic, by topical depletion of congested vessels, which depletion arrested at once the process of inflammation and brought on an issue by resolution. The writer has satisfactorily employed this process on small carbuncles before, but not on one so formidable as the present seemed likely to prove.

He hopes that his contemporaries may be induced to try the same process and report results. In this case he is satisfied that the subcutaneous process saved his patient weeks of suffering and a sound skin over the site of the lesion.

Ten years' subsequent experience confirms the above. A man aged about eighty had a carbuncle on his neck seven inches by nine inches, high fever, prostration, etc. Carbolic acid and quinine with the subcutaneous incisions entirely cured him.

Boston, 13 Temple Street, *June*, 1875.

REMOVAL OF HÆMORRHOIDAL TUMORS.

BY EDWIN R. MAXSON, M. D., OF SYRACUSE, N. Y.

Having been called in February, 1875, to operate for hæmorrhoidal tumors (piles) in the case of a prominent business man, about 150 miles from this city, who had been suffering for more than twelve years, and latterly very intensely, from their presence; I found, on examination, *six* tumors, nearly surrounding the bowels, varying from about an inch in diameter to one third of that size.

The largest tumor, though originally internal, being anterior, had become partly external, so that about one fourth of the mucous membrane covering it had assumed a *cutaneous* character. The other five tumors were internal, the largest of them occupying the left, and the other four the right and posterior walls of the bowels.

For years they had come down, when on his feet, and latterly, even when in the recumbent posture, causing intolerable pain, and great derangement of the urinary, digestive, and circulatory functions.

Having previously ordered a teaspoonful of cream of tartar, morning and evening, to act on the kidneys, relax the bowels, and counteract any hæmorrhagic tendency; and finally cleared the bowels by an injection of warm water, and thoroughly brought down the tumors by setting the patient over a vessel of warm water; after placing him on the side, I carefully drew the tumors into a favorable position, and passed a long needle through the base of the largest tumor, one through the second in size, and then another through the four remaining smaller ones, thus using three needles for the six tumors, a cork being placed on the point of each.

All being thus ready, the bases of the tumors were seized by long curved polypus forceps, firmly, as close down to the needles as possible, and cut off, one by one, with *dull* curved scissors, the cut surface from which each was taken being cauterized by nitric acid, applied by a smooth pine stick, of a size to be dipped into a common ounce vial containing the acid, the other end of the stick being armed with a cotton cloth, to mop up any excess of acid.

Lard was applied to the cut surfaces, immediately after the cauterizing; and also tannin, to check the slight oozing of blood following the removal of the forceps, and not prevented by the acid.

After retaining the cut surfaces down for about an hour, the needles were removed, one by one, and the parts being well covered with lard and tannin, were all crowded up.

To favor the flow of urine, as well as to secure quiet, eight drops of the tincture of stramonium were given every six hours, instead of an opiate. And, alternating with the stramonium, eight drops of the muriated tincture of iron were given, every six hours, to counteract a hæmorrhagic tendency, and also to favor the passage of urine.

Forty-eight hours after the operation, a tablespoonful of castor oil moved the bowels freely, with only slight uneasiness. Comparatively no pain or tenderness followed the operation, convalescence progressing rapidly, so that the patient was up an hour the third day, four on the fourth, eight on the fifth, and so on, sleeping quite well, and not losing a single meal from the first. The sphincter rapidly resumed its function in this, which was the most unpromising case for an operation I have seen in this country or abroad.

It will be seen that an operation by ligature was contra-indicated, if not impossible, on account of the number and extent of base of the tumors, four of them running together. The passage of the needles appeared to be a necessity, to keep the cut surfaces down till a security might be felt that no hæmorrhage would occur. The grasping with the forceps was a precaution against hæmorrhage at the instant of cutting, and to keep the cut surface in a good position for the application and action of the nitric acid. And this, in turn, was to prevent hæmorrhage, as well as for acting upon and contracting the surrounding congested and hypertrophied mucous membranes. But, to prevent this action of the acid from being too intense and extensive, a solution of prepared chalk in water was applied to the surrounding surfaces, so that no erysipelatous inflammation arose.

There was no apparent inflammatory, suppurative, or ulcerative action set up. Not an unfavorable symptom supervened. Nor does there remain a vestige of the disease, so far as I can learn, the cure being perfect, in the most strict sense of the word.

I have been thus particular in describing this operation and the result, because I am not aware that all of these steps have been taken, before, in any one operation. In fact, I was driven to them by the nature of the case. And, while I would not advise a careless attempt at its repetition, I should not, with the observation I have had, hesitate to repeat it, in any number of cases, however complicated.

THE ALKALOID OF JABORANDI.

In an article on the new drug in the Journal for June, we remarked that the alkaloid or other principle to which its properties were to be ascribed would probably soon be discovered. We now learn from the London *Chemist and Druggist* that Mr. A. W. Gerrard, of University College Hospital, after experimenting very laboriously and skilfully with both bark and leaves of jaborandi, has not only completely succeeded in separating the alkaloid of the plant, but has also recently produced crystals of the nitrate and hydrochlorate salts of this alkaloid, which he terms pilocarpine. The following is a brief digest of Mr. Gerrard's process for preparing the alkaloid: —

"Prepare a soft extract either of leaf or bark with 50 per cent. alcohol. Digest this with water, filter, and wash. Evaporate the filtrate to a soft extract, cautiously add ammonia in slight excess, shake well with chloroform, separate the chloroform solution, and allow it to evaporate; the residue is the alkaloid pilocarpine with probably a small amount of impurity.

"Besides the alkaloid, jaborandi contains an acrid resin, tannic acid, volatile oil, and chlorophyll. The acrid resin is soluble in ether, and possesses properties which indicate it to be the substance by which the effects of its external application are produced."

Forty-five grains of pilocarpine, produced as above described, were prepared. To this distilled water was added and sulphuric acid drop by drop until the alkaloid was nearly dissolved, and the solution was neutral. After setting aside for ten days for slow evaporation, and no definite crystals resulting, Mr. Gerrard made other experiments, employing nitric and hydrochloric acids. With these he has completely succeeded, and has produced nitrate and hydrochlorate of pilocarpine in a crystalline condition, which it is likely will be the future form in which this remarkable medicine will be administered. Mr. Jameson, Dr. Sydney Ringer's assistant, reports that half a grain of the nitrate produced the usual therapeutic effects of a full dose of jaborandi on a patient, within an hour; while one drop of solution of the nitrate (gr. 1 to ʒj.) put into the eye of a patient caused the pupil to contract to about the size of an ordinary pin's head.

MEDICAL CONSULTATIONS.

Some quaint and sensible advice to young surgeons called to meet in consultation is given in an article by Dr. Gillespie, "Medical Notes about Shakespeare and his Times," published in the *Edinburgh Medical Journal* for June, 1875. Dr. Gillespie quotes it from a rare tract by John Halle, a surgeon at Maidstone, entitled "An Historical Expostulation against the Beastlye Abusers, both of Chyrurgerie and Physyk in our Tyme," published in 1565, and reprinted by the Percy Society.

When thou art callde at anye time,
A patient to see;
And dost perceive the cure to greate,
And ponderous for thee:

See that thou laye disdeyne aside,
And pride of thyne owne skylle:
And think no shame counsell to take,
But rather with good wyll

Gette one or two of experte men,
To helpe thee in that nede;
And make them partakers with thee
In that worke to procede.

For in so doinge, thine honestye
Thou shalt well kepe and save;
Also thy patiente therby
Righte greate comforte shall have.
. . . . . .
And also if oughte goe a wrye,
Or hinder in thy cure,
The one maye mende the other's faulte,
While friendship dothe endure.

The wounded or sore man also
Shall have no cause to grudge,
In you such uniformitye
Whyle he may see and judge.
. . . . . .
But one thinge note, when two or moe
Together joygned be;
About the paynfull patient,
See that ye doe agree.

See that no discorde doe arise,
Nor be at no debate;
For that shall sore discomfort hym
That is in sycke estate.
. . . . . .
Wherefore what so ye have to saye,
In things aboute your arte,
Let it be done among your selves,
In secrete and a parte.

Wyth one consent uniformlye
Comforte the wounded man;
But unto some good frend of hys
Expresse all that ye can.
. . . . . .

A MODEL MOTHER.

The following extract from a letter published in the *British Medical Journal* embodies so valuable a lesson that we reprint it for the benefit of American mothers, and anybody else to whom it may prove practically suggestive: —

"Some months ago I received the intelligence that my boy, along with others at the same school, a few

miles from town, was stricken with scarlatina, and had been removed to the infirmary. Finding, next day, that no rash had appeared, I resolved to have him home. Having given directions for the sick-room to be prepared, I proceeded forthwith to St. George's Hospital, to arrange about sending the fever-carriage for the boy. I found, to my dismay, although it proved ultimately for my good, that the carriage was impracticable, owing to the fact that it would not permit of two horses, and one could not accomplish the journey. I was compelled, therefore, to go to our livery stable keeper, give him my confidence, and bind him over to take all necessary precautions afterwards. We had all the cushions removed, and air cushions and a few washable wrappers put in, and a servant was dispatched to bring back the patient. Meanwhile, the sick-room was prepared; and, for the sake of others, I may as well describe it. A well-ventilated room at the top of the house, cut off, by a long passage, from other rooms. The walls and ceiling are lightly papered and varnished; a slip of carpet is easily removed, leaving bare boards. No curtains, painted furniture, and an iron bedstead, with woven wire mattress, and a light hair mattress above. This is commonly called a hospital bed. The drawers were removed, with their contents, into another room, leaving the carcass to serve the purpose of shelves. Disinfectants and a hot bath were in readiness. About eight P. M. the carriage drove up, and a most hilarious invalid bounded forth, an emancipated slave! He had eaten all the oranges, enjoyed the drive, and exercised his lungs in puffing out the air cushions. Although the child had actually been in the infirmary, mixed up with some severe cases, beyond a little sore throat the disease did not develop, and he escaped."

NOTES AND MEMORANDA.

Internal Use of Sea-Water. — Those of our readers who used to visit the Appledore House at the Isles of Shoals in the days when the elder Laighton was the landlord, will doubtless recollect how he was wont to dilate upon the virtues of sea-water taken internally. If our genial host had lived till now, he would rejoice to find confirmation of his views in an article by Dr. Lisle in a late number of the *Bulletin Général de Thérapeutique*. His experiments have led him to the conclusion that, besides being an useful purgative, sea-water acts as an alterative in all such cases as are benefited by saline mineral waters like those of Nauheim, Soden, Homburg, etc. He finds that its continued use increases the appetite, facilitates digestion, quickens nutritive changes, and augments the proportion of red corpuscles in the blood. Accordingly he recommends it: (1) during convalescence from acute diseases; (2) in the apyretic forms of dispepsia; (3) in neurosis associated with impoverishment of the blood; (4) in the scrofulous and tuberculous diathesis; (5) in diabetes. Sea-water may be agreeably administered in bread, in the form of a syrup, or in that of an elixir. Bread made with sea-water can only be procured at the sea-side; it is very palatable, and contains nearly five grammes of the mineral constituents of the water in each pound. The syrup is prepared by mixing 250 grammes of sea-water with a sufficiency of sugar and distilled water to make 500 grammes. Each tablespoonful of the syrup contains about twenty-five centigrammes ($3\frac{3}{4}$ grains) of the saline residue of sea-water; from two to five tablespoonfuls may be taken daily. The formula for the elixir is: sea-water, 200 grammes; rum, 200 grammes; sugar and distilled water up to 500 grammes. The dose at first is a tablespoonful three times a day.

British Anti-Vaccinators. — One of the inalienable rights for which certain Britons are at present contending is the right to have the "old original" small-pox, unmitigated by vaccination. A "great demonstration" was made at Banbury, a month ago, against the Compulsory Vaccination Act. A clergyman, the Rev. Horne Rothery, was the prime mover in the affair, which occurred on the release from Northampton jail of a man who had suffered fourteen days' imprisonment rather than have his child vaccinated. "On the arrival of the released prisoner," says a London paper, "crowds of persons carrying banners, and attended by bands of music, met him at the station, and presented him with a purse of gold; a meeting was subsequently held, at which the usual speeches were made, and the usual resolutions passed in condemnation of the act. There is little doubt but that other sham martyrs to this useful act may be obtained by the prospect of a similar reward in the shape of a purse of gold. The real martyrs are beyond reach of purses or testimonials."

Smoking Rooms in Boarding Schools. — The *Philadelphia Medical and Surgical Reporter* says: "We have recently been surprised to learn that in two well patronized and highly praised boys' boarding schools, near this city, *smoking rooms* are kept for such of the boys as have permission from their parents to smoke! We are further informed that these are not singular in that respect, as many other schools also have them. The pupils are from nine to eighteen years of age. Surely, if parents are so grossly ignorant or criminally negligent of the laws of health, professed guides of youth ought to know better, and discourage by every possible means the use of tobacco in growing boys. It may be a question whether it is harmful to a man, but there is none whatever that it is seriously injurious to boys." This fact, by the way, is not so generally known as it ought to be. Fathers who smoke sometimes feel that to forbid their boys the same indulgence savors of inconsistency; but they may safely take the ground that tobacco should not be used in any form during the period of growth and adolescence. As our contemporary remarks, the mischievous effects of the weed in boyhood are unquestionable, whatever difference of opinion there may be as to its moderate use later in life.

A French Lady-Physician. — Madame Brès, who was received, this last June, into the Faculty of Medicine of Paris, is the first French lady who has taken such a step. She passed all her examinations in a most creditable manner, and M. Wurtz, the president of the examining board and dean of the faculty, addressed her in the following terms: "Madame, you have not only raised women from the secondary position they have held in medicine, but your thesis is one of the best that the faculty of Paris has ever received, and it will be consigned with honor to its archives." The title of the thesis is "La Mamelle et l'Allaitement," a very appropriate subject for a doctress; it is treated in an anatomical, a chemical, and a physiological point of view.

Hydrate of Chloral. — M. Oré states, in the *Journal de Pharmacie*, that a very small quantity of carbonate of soda is sufficient to remove the acidity of chloral hydrate in solution, and to render it alkaline. There is a slight disengagement of carbonic acid, and some chloride of sodium is formed. Comparative experiments have shown that whilst chloral hydrate retards the coagulation of blood, chloral hydrate thus rendered alkaline by carbonate of soda entirely prevents it. It is claimed that the addition of the soda does not at all interfere with the anæsthetic properties of the chloral.

Thymol, the New Antiseptic. — Herr S. Lewin has lately made some experiments in Professor Liebreich's laboratory in Berlin on the antiseptic and antifermentative properties of thymol.

This substance, the formula of which is $C_{10}H_{10}O$, belongs to the benzol group. It forms white crystals of a highly aromatic odor. A solution of 1 part in 1000 of hot water has a neutral reaction, and is of sufficient strength for all purposes. Comparative experiments with carbolic and salicylic acids showed that thymol possessed much greater power than either of these acids in arresting fermentation in a solution of sugar after the addition of yeast. The addition of thymol to milk caused coagulation to appear 20 days later than in milk to which a similar quantity of water had been added, and at the end of 5 weeks there was still no trace of vegetation. While filtered egg albumen underwent decomposition in 3 or 4 days on exposure to the air, albumen to which thymol water had been added did not present the slightest sign of putrefaction at the end of 11 weeks, and an aromatic odor was still perceptible. Herr Lewin also found thymol to arrest putrefactive change in bony substances for 5 weeks.

Practical Christianity. — During the warm season of the last two years the board of government of the Boston Young Men's Christian Union has furnished carriages to the various hospitals of the city, so that many of the patients were enabled to enjoy a ride in the country, and derive the benefit of the fresh air as they could not otherwise have done. This charity has not only been extended to the inmates of hospitals, but has also included many an invalid living in circumstances too limited to allow of such an indulgence. To enable the union to meet the expenses thus incurred, a public appeal for special donations was made, as of course the furnishing of rides for convalescents does not legitimately belong to the work of the society, and hitherto a generous response has been made to the appeal.

The Practical Results of Sanitary Improvements in Dwellings. — In a paper recently read before the Statistical Society of London, "On Improved Dwellings and their Beneficial Effect upon Health and Morals," it was stated that the average annual rate of mortality during the eight years ending 1874, in the houses erected by the Metropolitan Association for Improving the Dwellings of the Industrial Classes, did not exceed 14 per 1000, whereas the average rate in the whole of London during that period was 24 per 1000.

SELECT FORMULÆ.

A New Adhesive Plaster. — Kauvin recommends a mixture of twenty parts of mucilage of gum arabic and one part glycerine, spread three or four times upon linen at sufficient intervals to allow it to thoroughly dry. This plaster is glossy, pliable, does not deteriorate with keeping, and is considerably cheaper than English plaster or diachylon plaster.

Harmless Cosmetic Powders. — The *Journal of Pharmacy* announces the fact that the apothecaries of Copenhagen have agreed on the substitution of certain harmless compounds for the numerous poisonous face-powders now commonly used. In avoirdupois weight, the proportions of the ingredients will be about as follows: for white powder, oxide of zinc, 1 oz.; wheat starch, 9 oz.; oil of rose, 3 drops: for red powder, carmine, 1 oz.; carbonate of magnesia, 4 oz.

Egg Drink. — The following drink for relieving sickness of stomach was introduced by Dr. Halahan, and is very palatable and agreeable: "Beat up one egg very well, say for twenty minutes, then add fresh milk, one pint; water, one pint; sugar, to make it palatable; boil, and let it cool; drink when cold. If it becomes curds and whey it is useless."

Arsenic Antidote. — In the formula under this head, in the last Journal, "persulphate of *soda*" was put instead of "persulphate of *iron*," but the remainder of the paragraph makes it clear that the latter is meant. The error was inadvertently repeated from the London journal from which we took the recipe.

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Familiar Science.

THE CHEMISTRY OF OUR FOOD.

IV.

THE foods already considered, whether nitrogenous or non-nitrogenous, consist of substances which are derived directly or indirectly from plants, and which are therefore of an *organic* nature. Inorganic or "mineral" substances, although they may contain all the elements which enter into the composition of our bodies, cannot, as a rule, minister to our nutrition. Our bones contain a large proportion of calcic phosphate, or phosphate of lime; but we cannot furnish material for the nourishment of our bones by taking the mineral phosphate of lime into our stomachs. This and the other mineral substances necessary for our bodily sustenance are found in the vegetable or animal substances (and the animal is of course vegetable one step further back) which make up the bulk of our food, and it is almost exclusively through this channel that they are supplied.

The only minerals for which animals have an instinctive longing or natural appetite are water and common salt, which do not always exist in foods in sufficient quantities to supply their wants. The dietetic relations of water have been often discussed in the JOURNAL in other connections, and, though the subject has been by no means exhausted, may be passed by for the present. Salt, or chloride of sodium, as we need hardly say, is a compound of chlorine with the metal sodium. Chloride of potassium is a compound of chlorine with the kindred metal potassium. Both these salts are essential to animal life; yet no animal would willingly eat the latter in its mineral form, while every animal if deprived of common salt in its food will devour that mineral greedily. How is this natural aversion for the one and this instinctive appetite for the other to be explained?

Chloride of potassium and other salts of that metal are to be found abundantly in every plant. No vegetable, except perhaps of the very lowest order, could be developed without these salts. On the other hand, sodium does not appear to be essential to vegetable life, and it is often wholly wanting in the seeds and roots which form the most important kinds of vegetable food. It would seem, then, that nature has endowed animals with an appetite for mineral sodium, because that substance is not always obtainable through the agency of plants.

Salt and other saline matters are useful in causing the conversion of food into animal tissue. Dissolved in water, they constitute solutions which pass readily through the structures of the body, carrying with them the nutrient materials wherewith the waste of the body is repaired. There is very little salt in the solid tissues; but it forms nearly one half of the weight of the saline matters of the blood. An adult requires daily from a quarter to half an ounce of salt. In barbarous ages it is said that persons were put to a painful death by confining them to a diet from which salt was excluded. In certain parts of the world where the ordinary food used contains no salt, that article acquires a high value. In parts of Africa a man will sell his child, and even his wife, to procure supplies of this coveted article.

To the food substances already considered are to be added certain stimulants and condiments, the appetite for which in some form or other, if not natural, is readily acquired by man, whatever his race or condition. Tea, coffee, and other stimulant beverages come under this head, and also sugar, vinegar, spices, and other substances of strong flavor employed to impart piquancy to the staple foods. The former we shall not consider here; the latter may claim a passing notice. These condiments stimulate the appetite, promote the flow of saliva, and in some instances unquestionably aid in the next stage of the digestive process, carried on in the stomach. With the exception of salt and sugar, children rarely require condiments, as their appetites are usually good enough without any stimulus. In middle and old age, the warmer condiments that are "hot i' th' mouth," such as mustard and pepper, are often found valuable aids to digestion. Vinegar dissolves albuminous substances except casein and is therefore a useful addition to many varieties of food. Used too freely it may attack the muscular tissues, and cause an unnatural wasting of the body. It is sometimes adulterated with sulphuric acid, which adds to the mischief it may do when thus used in excess.

These condiments, from their stimulating properties, give to a vegetable diet somewhat of the character of a flesh diet. That which chiefly distinguishes the latter diet from the former is its more stimulant quality. A stimulant food, as defined by an excellent medical authority, is "one that excites the nerves of taste, is quickly digested, soon passed into the blood, and soon felt by the heart and brain." If we accept this definition, which seems to us an admirable one, there can be no doubt that the animal food in general use is more stimulant than the vegetable. A bowl of beef-tea, for example, is more immediately felt than a bowl of gruel; and a good beef-steak would set a tired man on his legs more quickly, and be less troublesome to the stomach, than a meal of bread and vegetables. "The vegetable world can offer nothing to take the place of raw meat, or of the juice or essence of flesh."

But there are plenty of vegetable stimulants, some combined with nourishment, as onions and mushrooms (the dietetic value of which is better appreciated in Europe than in this country); others uncombined, as the peppers and spices. And these can be used to give to vegetable food something of the flavor and stimulating properties of animal food. On this subject the following remarks from a recent English medical journal are in point: —

"Poor people, who wish to reduce the quantity of flesh for economical reasons, must fall back upon the farinacea and on vegetables generally, and endeavor, by appropriate admixture of vegetable condiments, to imitate the stimulating and satisfying qualities of animal food. In fact, puddings and other dishes which are too commonly eaten with sugar should be made *savory* by the addition of the condiments that generally accompany meat. This is well understood by the vegetarians, who publish a dozen 'vegetarian recipes' on a half-penny sheet. In eight of the twelve dishes we find onion; in six, mushroom; the savory herbs, parsley, pot marjoram, lemon thyme, or balm, and pepper, in almost all; whilst the substantial ingredients are bread, macaroni, and potatoes, with eggs and milk. . . . . With the abundant means at hand for adding a savory flavor to vegetable food, especially with grated cheese, with the pot-herbs, with all the full-flavored vegetables, of which garlic (could people but learn how to use little enough of it) is the chief, with all the aromatics, the supreme use of which is shown in the Indian curry, it must be strange if any housewife who tries cannot find the means of satisfying the stomachs and palates of her household, without having to deplore a heavy butcher's bill."

CLIMBING PLANTS.

THE motions of "carnivorous plants," briefly noticed in the last number of the JOURNAL, are not the only phenomena of the kind which seem almost like the voluntary movements of animals. No one can see the sensitive plant fold its leaflets suddenly together at the lightest touch without the thought that, if it has not feeling and volition, it behaves very much as if it had both. No less curious are the movements of the *Desmodium gyrans* of India, sometimes seen in our hot-houses, the leaflets of which, "under the temperature of a sultry summer's day, may be seen to rise and fall by a succession of jerking movements, not unlike those of the second-hand of a clock, but without much regularity, now stopping for some time, then moving briskly, always resting for a while in some part of their course, commonly at the highest and lowest points, and starting again without apparent cause, seemingly of their own will." Many plants of the pulse family and of other families recline or assume other singular positions at night. The leaves of house plants turn their upper face toward the light. The motions of twining plants are specially interesting. Some twine with the sun, as the hop and most honeysuckles; while the morning-glory, bindweeds, beans, etc., turn from left to right, or against the sun. When a twining stem overtops its support, the lengthening shoot is seen thrown over to one side, and usually outstretched. One might suppose it had fallen over by its weight; but it is not generally so. If turned over, say to the north, when first observed, it will probably be

found reclining to the south an hour or so later, and an hour later again turned northward. That is, the end of the stem is sweeping round in a circle continually, like the hand of a clock. It keeps on growing as it revolves; but the revolving has nothing to do with the growth, and indeed is often so rapid that several complete sweeps may be made before any increase in length could be observed. The time of revolving varies in different species. It also depends upon the weather, being slow or imperceptible when it is cool, and more rapid when it is warmer. Sometimes it stops when everything seems favorable, and starts again after a while. The hop, bean, and morning-glory are as quick as any. In a sultry day, and when in full vigor, they commonly "swing round the circle" in less than two hours. They move by night as well as by day. When the free summit of a twining stem is outstretched to two feet or more in length, so as to magnify the motion, this is sometimes rapid enough to be actually seen in some part of the circuit.

"Because twining stems," says Professor Gray, "are often twisted more or less, some have supposed that the twisting was the cause of the revolving sweep of the free end. If so, the stem below would in a day or two be likely to twist itself off. And twiners seldom twist much when climbing a smooth and even support. To learn how the sweeps are made, one has only to mark a line of dots along the upper side of the outstretched revolving end of such a stem (say that of the morning-glory), and to note that when it has moved round a quarter of a circle, these dots will be on one side; when half round, the dots occupy the lower side; and when the revolution is completed, they are again on the upper side. That is, the stem revolves by bowing itself over to one side — is either pulled over or pushed over, or both, by some internal force, which acts in turn all around the stem in the direction in which it sweeps; and so the stem makes its circuits without twisting.

"So the sweeping round of the stem is a movement like that wonderful one of the leaflets of *Desmodium gyrans*, only slower. And here we see what it is for. The sweeping movement of the stem is the cause of the twining. The stem sweeps round that it may reach some neighboring support; as it grows, it sweeps a wider and wider space, that is, reaches farther and farther out. When it strikes against any solid body, like the stalk of a neighboring plant, it is stopped; but the portion beyond the contact is free to move as before; and, continuing to lengthen and to move on, it necessarily winds itself round the support, that is, *twines*."

Plants climb by roots, as in the case of the iris and trumpet-creeper; by stems, as in the case of the hop and honeysuckle; by leaves, blade, or petiole, as in the clematis; and by tendrils, as in the passion-flowers. The latter means is the most exquisite, as it is one of the commonest of the contrivances for climbing. The tendril, as it grows, stretches out horizontally, as if in search of a supporting object. Being more slender than a stem or any other sort of stalk, it can thus extend farther at the least expense of material. In the most perfect tendrils, and notably in the slender passion-flowers, opportunities for securing a hold are much increased by the revolving of the tendril. It sweeps circuits, like the stem of a twiner, with less regularity, indeed, but sometimes with great rapidity. In hot weather these tendrils often move through the complete circle in an hour or less, or even so fast that the motion of the end of a long tendril may sometimes be distinctly seen in a part of its course.

"In revolving tendrils," to quote again from Professor Gray, "the most wonderful thing to remark is the way in which they avoid winding themselves around the stem they belong to. The active tendrils are of course near the top of the stem or branch. The growing summit beyond the tendril now seeking a support is often turned over to one side, so that the tendril, revolving almost horizontally, has a clear sweep above it. But as the growing stem lengthens and rises, the tendril might strike against it and be wound up around it. It never does. If we watch these slender passion-flowers, which show the revolving so well in a sultry day, we may see, with wonder, that when a tendril sweeping horizontally comes round so that its base nears the parent stem rising above it, it stops short, *rises stiffly upright, moves on in this position until it passes by the stem, then rapidly comes down again to the horizontal position*, and moves on so until it again approaches and again avoids the impending obstacle!"

The mimicry of volition, if it be no more than mimicry, can hardly go farther than this. Certainly many of the lowest orders of animals appear to have less feeling and less intelligence. How shall we distinguish the one from the other? The old dictum that animals feed only on organic and plants only on inorganic matter, can no longer be maintained, if the "carnivorous plants" really devour and digest insects and raw meat. Some recent experiments indeed seem to show that all plants can be nourished with organic substances. Dr. Carpenter, in England, says that he has fed plants with beef-tea, and that they flourished better on it than on their ordinary food. But this is a subject that might well demand an entire article, and we shall revert to it at some future time.

NATURAL ICE-HOUSES.

In this August weather, even if one cannot "keep cool," there is a certain satisfaction in dwelling upon a refrigerating subject. If we cannot in reality run away from the dog-day heat, let us in imagination pay a visit to some cooler locality — for instance, the "ice-caverns" that are found in various parts of Europe.

In general the temperature of caverns is less than the mean temperature of the surrounding atmosphere; cooler, therefore, in summer, and warmer in winter. It shows little diversity also through the year, where the roofs are thick and the openings narrow, so as to have but a very limited communication with the external air. In others, however, differently constructed, great changes of temperature occur, and several are actual ice-houses during summer and agreeably warm during winter.

An instance of one of these summer-produced ice-caverns occurs near the village of Sezelitze (to adopt one of several ways of spelling it), in Upper Hungary. The neighboring country is hilly, the limestone formation of the Carpathian Mountains. It abounds with woods, and the air is sharp and cold. The entrance of the cavern, which faces the north, is 108 feet high and 48 feet broad, consequently ample enough to receive a large supply of the external air, which here generally blows with great violence. Subterraneous passages stretch away from it southward to a greater distance than has yet been penetrated. In the midst of winter the air in this cavern is warm, but in summer, when the heat of the sun without is scarcely supportable, the cold within is not only very piercing, but so intense that the roof is covered with icicles of great size, which, spreading into ramifications, form very grotesque figures. When the snow outside melts in spring, the roof of this cave emits a pellucid water, which immediately congeals as it drops. This forms the icicles mentioned, and the water that drops from them on the sandy floor freezes in an instant. It is even observed that the greater the heat is without, the more severe the cold is within; so that in the dog-days all parts of this cavern are covered with ice, which the inhabitants of Sezelitze use for cooling their liquors. The quantity of ice thus formed is sometimes so great that it has been estimated at six hundred wagon loads in a week. In autumn, when the heat of the day begins to abate, and the nights grow cold, the ice begins to dissolve, and is quite cleared away by Christmas. When the cavern is perfectly dry it has an agreeable temperature, and is the haunt of swarms of flies, gnats, bats, owls, hares, and foxes, which resort to it as a winter retreat.

When travelling in Russia, Sir Roderick Murchison met with a cavern of a similar description, near the Imperial Saltworks, at Ileski, on the south of the Ural Mountains, where a series of natural hollows occur in a mass of gypsum. At the distance of about five leagues from Besançon, in France, there is another example of a grotto, containing ice in summer a foot and a half thick on the floor and festoons of icicles around the opening inside, which melt away as the winter approaches.

These singular phenomena are susceptible of a very satisfactory explanation. They depend on the relation which subsists between the moisture in these caverns and the external air. In summer, when it is hot and dry outside, evaporation takes place; by this means a considerable degree of warmth is withdrawn from the inclosed air, the vapors making their escape through the openings and through fissures in the rock roof. As the external temperature increases, the more rapidly is the evaporation carried on, producing a degree of cold in the interior which may sink beneath the freezing point, just as in the greatest heat we can most readily freeze water if we surround it with ether or some other exceedingly volatile liquid. In winter, on the contrary, the more the warmth and dryness of the external air are diminished, the less will be its capability of promoting evaporation in the cavern, the warmth contained in the air will no longer be extracted, and the ice which has been produced must melt. For the summer cooling in these caverns, however, to sink below the freezing point there must be a certain relation which but rarely exists between the opening and the evaporation surface of the interior. If the opening be too large, too much warm air is introduced, and the temperature of the interior is thereby so much increased that it cannot be diminished by evaporation. If it be too small, the vapors cannot without force withdraw themselves fast enough, and the evaporation is lessened because the surrounding air is saturated with moisture. The ice-caverns, therefore, are comparatively rare, though several others are known in addition to those described above.

A HEAVY RAIN.

What a heavy rain really means in avoirdupois weight is well illustrated by some statistics given by Mr. Symons in his recent report on "The Rainfall of Great Britain for the Year 1874." The rain of October 6th was the most important which occurred during the year, and has probably had no equal since July 6, 1872. At about 80 stations the fall exceeded 2 inches; at 28, 3 inches; at 4, 4 inches; and at 2, 5 inches. The heaviest rain, from 2 inches to 5 inches and more, was pretty well confined to the western part of England; parts of Cumberland, Westmoreland, and North Wales having had falls of 5 inches. In connection with this widely-distributed and in some places heavy fall, Mr. Symons has given an interesting calculation of the whole weight of water precipitated on this day, which he reckons at 3,797,000,000 tons. He adds:—

"It is a rather curious, although purely fortuitous circumstance that this grand total of nearly 4,000,000,000 tons should be almost exactly equal to a uniform fall of 1 inch over the whole of England and Wales. There is another aspect of the question which has not yet received adequate study: How much air has been deprived of its vapor to provide this uniform deposit of 1 inch of rain? A cubic inch of water contains 252 grains. Taking the temperature of the air at 55°, a cubic foot can contain only five grains; and as the air was certainly not deprived of half its moisture, even allowing for change of temperature, each cubic foot could have yielded at the most only three grains. But there are 1728 cubic inches in a cubic foot, and therefore each cubic inch could have given only $\frac{3}{5}\frac{1}{7}\frac{1}{6}$ (say $\frac{3}{5}\frac{1}{6}\frac{1}{0}$) of a grain. As the inch of rain requires 252 grains, we have the result, $252 \times 600 = 151{,}200$ vertical inches, or 12,600 feet, or rather more than two miles high of air must have been dried to have yielded the water deposited."

A BLADE OF GRASS.

Gather a single blade of grass, and examine for a minute, quietly, its narrow, sword-shape strip of fluted green. Nothing, as it seems, there of notable goodness or beauty. A very little strength, and very little tallness, and a few delicate long lines meeting in point — not a perfect point either, but blunt and unfinished — by no means a creditable or apparently much cared-for example of Nature's workmanship; made, as it seems, only to be trodden on to-day, and to-morrow to be cast into the oven; and a little pale and hollow stalk, feeble and flaccid, leading down to the dull brown fibres of the roots. And yet, think of it well, and judge whether of all the gorgeous flowers that beam in summer air, and of all strong and goodly trees, pleasant to the eyes or good for food, — stately palm and pine, strong ash and oak, scented citron, burdened vine, — there be any by man so deeply loved, by God so highly graced, as that narrow point of feeble grass. And well does it fulfil its mission. Consider what we owe merely to the meadow grass, to the covering of the dark ground by that glorious enamel, by the companies of those soft and countless and peaceful spears. The fields! Follow but forth for a little time the thoughts of all that we ought to recognize in these words. All spring and summer is in them — the walks by silent scented paths, the rests in noonday heat, the joy of herds and flocks, the power of all shepherd life and meditation, the sunlight upon the world falling in emerald streaks, and falling in soft blue shadows, where else it would have struck upon the dark mould or scorching dust — pastures beside pacing brooks — soft banks and knoll of lowly hills — thymy slopes of down overlooked by the blue line of lifted sea — crisp lawns all dim with early dew or smooth in evening warmth of barred sunshine, dinted by happy feet, and softening in their fall the sound of loving voices, — all these are summed up in those simple words, the fields; and these are not all. We may not measure to the full the depth of this heavenly gift, in our own land; though still, as we think of it longer, the infinite of that meadow sweetness, Shakespeare's peculiar joy, would open on us more and more, yet we have it but in part. Go out, in the springtime, among the meadows that slope from the shores of the Swiss lakes to the roots of the lower mountains. There, mingled with the gentians and the white narcissus, the grass grows deep and free; and as you follow the winding mountain paths, beneath arching boughs all veiled and dim with blossom, — paths that forever droop and rise over the green banks and wolds sweeping down in scented undulation, steep to the blue water, studded here and there with new-mown heaps, filling all the air with fainter sweetness, — look up toward the higher hills, where the waves of everlasting green roll silently into their long inlets among the shadows of the pines; and we may, perhaps, at last know the meaning of these quiet words of the 147th Psalm, "He maketh grass to grow upon the mountains." — *John Ruskin.*

FAMILIAR SCIENCE NOTES.

Vapor of Mercury. — M. Merget has discovered that by dissolving iridium, palladium, platinum, gold, or silver, in *aqua regia*, a reagent is obtained which is extremely sensitive to mercury, and which will, he believes, prove of great value in the solution of very many practical and theoretic problems. A paper impregnated with such a solution is marked with an indelible black stain as soon as it is brought in contact with mercury or mercurial vapor, no matter how small the quantity or how low the temperature may be. M. Merget also hopes to be able to throw great light upon the problem of a limited or an unlimited atmosphere, which was investigated without success by Wollaston and Faraday. He expects to be able to prove that mercury constantly sends forth a vapor, which ascends to the height of a mile at the rate of five hundred and fifty feet per second. As a practical result of his research, M. Merget, by means of these test-papers, exhibits the presence of mercurial vapor in all the workshops and warehouses where this metal is used or stored. If a workman passes but one hour in such an atmosphere, his clothing, face, hair, and beard become impregnated with mercury. If he but touches one of the prepared papers he testifies to the presence of the mercury by a well-defined black mark.

Captain Boyton Anticipated. — A correspondent of the *London Times* writes: "Among the Nineveh marbles in the British Museum there is a basso-relievo showing the manner in which the Ninevites crossed the water. An inflated bag, probably made of the skin of an animal, is strapped round the body immediately above the hips, and on this bag the man supports himself, while he propels himself with his hands. At the other end of the bag which extends to his chin, there is a mouthpiece for inflation. I have figured this interesting relic in my 'Instinct and Reason,' to show how the Caucasian race, from the earliest periods of history, had a knowledge of the properties of matter, and a capacity to employ it for their various purposes."

Bleaching Action of Chlorine. — M. A. Boillot, in the *Comptes Rendus*, points out that the bleaching action of chlorine is not a property inherent in the gas itself, but a secondary result of its power of abstracting the hydrogen from water in organic compounds. On allowing chlorine to act on any animal or vegetable matter, it decomposes a certain quantity of water and seizes its hydrogen, forming hydrochlorie acid. The oxygen set free by this reaction is transformed into ozone, which in its turn lays hold of hydrogen present in organic matter.

Quickening the Germination of Seeds. — We have before referred to the experiments made with camphor as a means of hastening the germination of seeds. Some time ago Goeppert attributed a similar property to chlorine, iodine, and bromine. According to the *Comptes Rendus*, these statements have been recently confirmed by the experiments of Heckel. The seeds of *Raphanus sativus*, exposed to the action of pure water, began to germinate after an average interval of eight days; similar seeds, kept moist with iodine water, germinated in five days; with bromine water in three, with chlorine water in two days. The monobromide of camphor was found to exhibit even greater energy than either of its constituents taken separately, or than a simple mixture of bromine and camphor, germination occurring after a mean interval of thirty-six hours. No explanation of this singular property is suggested. The alkaline borates and silicates were found to retard germination, even in relatively small proportions; stronger solutions checking the process for an indefinite period. Arsenious acid and the soluble arseniates prevented germination altogether by destroying the embryo.

How a Swarm of Bees is Suspended. — The sight of a swarm of bees suspended from the branch of a tree, and so heavy sometimes as to bend it, is a surprising one, and the observer naturally asks how so great a weight can be supported, without apparent fatigue, by the few scores of bees that are fixed to the inferior surface of the branch. According to Dr. Bourgeois (in *Les Mondes*) modern science estimates the amount of weight which can be supported by means of a vacuum (of which the sucker on a bee's foot affords an example) at 1 kilogramme 30 grammes per square centimetre. Now the sucker of a bee's foot, magnified 60 diameters, represents a surface of more than a centimetre. Each bee having six feet, it will therefore be possible for 10 bees to support the weight of 1 kilogramme. Thus, the phenomenon in question may be accounted for.

We find the above abstract in one of our English exchanges. Dr. Bourgeois appears to have forgotten that in magnifying 60 diameters the *surface* is magnified 3600 times; so that, assuming the other elements of the computation to be correct, it would take 600 bees, instead of 10, to support a kilogramme, or about $2\frac{1}{5}$ pounds avoirdupois.

FRENCH RECIPES FOR COOKING POTATOES.

Purée of Potatoes. — This differs from mashed potatoes only in the employment of more milk and butter, and in the whole being carefully reduced to a perfectly smooth, thick, cream-like mixture. Where economy is a great object, and where rich dishes are not desired, the following is an admirable mode of mashing potatoes. Boil them till thoroughly done, having added a handful of salt to the water, then dry them well, and with two forks placed back to back, beat the whole up till no lumps are left. If done rapidly, potatoes thus cooked are extremely light and digestible.

Potatoes Sautées. — These are even more agreeable with meat than fried potatoes. Cold boiled potatoes are sliced up, and tossed up in a saucepan with butter, mixed with a little chopped parsley, till they are lightly browned. Pure goose or other dripping is by many cooks preferred to butter for this purpose.

Potatoes Soufflées. — These delicious blistered potatoes are prepared as follows: The potatoes, if small, are simply cut in halves; if large, cut into three or more slices; these are fried in the usual way, but are taken out before they are quite done, and set aside to get cold; when wanted they are fried a second time, but only until they are of a light golden color, not brown.

Practical Chemistry and the Arts.

THE GIFTS OF NATURE AND OF ART.

In his elementary papers on political economy Edmond About combats the popular notion that we owe so many useful things to Nature, and shows that in almost every instance their chief value has been the contribution of art, that is, in something added to them by human ingenuity or labor. A sailor shipwrecked on an uninhabited island, though surrounded with the gifts of Nature, is in danger of absolute starvation unless, like Robinson Crusoe, he tasks his inventive powers to the utmost in the endeavor to make those gifts available for his sustenance. The following passage, which we translate from the lively French writer, develops this idea more fully: —

Nature by herself supplies us with very few useful things. Excepting the soil which sustains us, the air we breathe, the water we drink, there is nothing which, to my mind, is due to her. Our first resources. or, more properly speaking, all the gifts of humanity, are the conquests of labor. Man can neither create nor destroy an atom of matter, yet he can assimilate and identify himself with whatever suits him; he can turn aside whatever menaces him; above all, he can adapt for his use and employ for his profit that which was originally valueless or even dangerous. By means of labor he impresses the stamp of utility upon all he touches, and thus little by little annexes, as it were, the entire earth. Utility proceeds from and returns to man. If we do not create things themselves, we create their usefulness. But that costs something. Nothing is got for nothing. We are not Nature's spoiled children. After man was created, he appears to have been told, "I leave you to yourself. Whatever you produce is your own." Do you wish to see by some examples how man does his part and becomes the producer of utility? If, on leaving home an hour hence, you met a lion at the bottom of the stair, would you hesitate for an instant in regarding it as a noxious animal? Is not this true? However, thanks to the strenuous exertions of several generations, lions, driven from Europe, have now no abode save Africa. The distance which separates you from them enables you to think of them with indifference. When an agile, brave, and skilful man succeeds at the risk of his life in accomplishing the trifling task of lodging a ball between a lion's eyes, the animal is no longer noxious, nor even indifferent and useless. Its skin is worth forty-two francs: it will make a rug. Suppose that, instead of shooting the brute, a prudent hunter, by means of greater strategy, should entrap and imprison it in an iron cage and bring it to Marseilles? The lion, disembarked at the dock, would fetch many thousand francs. If, by means of still more skilful and longer continued labor, a lion tamer, like Batty, subdues the dread monster, the lion would fetch thirty thousand francs at least. Nature creates a devouring animal; human skill converts it into a bread-winner. The whole race of domesticated animals in man's service, yielding him eggs, milk, wool, and even flesh, was wild at first, that is to say, was so far separated from, as to be of no use to him. By his skill he not only tamed these animals, but, as it were, he has modified and remodelled them after a pattern supplied by himself. Man fashions at will draught-horses and racers, oxen for the plough and oxen for the table, sheep which furnish wool and sheep which furnish tallow, fowls which lay eggs and fowls which are fitted for the spit, fat pigs and lean pigs; from one breed of dogs man has produced the greyhound and the bull-dog, the setter and the harrier, the pointer and the lapdog. When you go to an exhibition of any sort of live animals, remember that art has as great and Nature as little a share in it as in an exhibition of pictures. Apply the same method of reasoning to all agricultural, arboricultural, and horticultural exhibitions. Neither our gardens, our fields, nor our woods are masterpieces of Nature, as is ignorantly said; they are masterpieces of human industry. All double flowers, without exception, are man's work. Pluck a wild rose from a hedge-row, and then go and see a collection of Verdier's roses; you will learn how much Nature has bestowed, and what man has made of it. All the pulpy and juicy edible fruits are man's work. Man went as far as Asia, and even farther, in quest of the coarse products which resemble our peaches, our cherries, our pears, as much as the wild rose resembles the "Remembrance of Malmaison" rose. Each of our vegetables represents not only distant voyages, but also centuries of skilled labor and assiduous elaboration. It was not Nature that gave the potato to the poor of our land. Human industry went in quest of it to America, and has cultivated, modified, ameliorated, varied, and brought it step by step to its present state, accomplishing the result in less than a century. Yet to this century of culture must be added the prior labor bestowed on the plant by the natives of America. When the products of a distant country are brought to us, we are prone to believe that Nature alone has done everything. But when the Spaniards discovered America, it had been cultivated from time immemorial. Hence man had turned Nature to his advantage there, as well as in Europe and elsewhere. Wheat, such as we see it, is not a gift of Nature. It grows spontaneously in Upper Egypt, yet there it yields but a poor and miserable seed, unfitted for making bread. Many ages and prodigious expenditure of labor were required in order to develop and perfect the seeds of this useful food for man. Have you ever been told that wheat is distinguished from other cereals by its containing a notable proportion, sometimes a quarter, of nitrogenous substances? This valuable gluten represents the blood and flesh of thousands of generations that perished in the culture of wheat. While labor supplied the most precious of its useful properties to this grain, of which each of us consumes three hectolitres yearly, pharmacy altered the use of fifty vegetable poisons, and converted them to the profit of our species.

MEMORANDA IN THE ARTS.

A Blind Inventor. — A blind man, Andrew Fleming by name, died last month in Scotland, who was remarkable for his mechanical ingenuity. He was born in Paisley, and learned the trade of a moulder whilst working at the Phœnix Iron Works, Glasgow. Some years ago he lost his sight by an accident, and was admitted into the Glasgow Asylum for the Blind. It was in this institution that his extraordinary faculty for inventing and constructing machinery was developed, his object being to make appliances which could be worked by blind persons, thus obviating the necessity of employing ordinary workmen to perform the labor. The first result of his ingenuity was a cropping machine, used to trim the brush mats manufactured at the asylum. This is fitted with four revolving knives and one stationary, placed at such an angle that they act as shears. The head upon which these knives are placed moves gradually along the face of the mat — the machine having two motions, one of which provides motive power to the rollers upon which the mat is placed, and the other being a horizontal movement, propelling the head of the knives along a grooved shaft. The work now effected by this machine, managed by a blind person, was formerly done by a person gifted with sight at a much slower rate, the instrument used being an ordinary pair of shears. Fleming's next machine is for boring brushes, and is an adaptation of the vertical principle of boring, and although it cannot be used for all the purposes required for boring brushes, yet much of the work is accomplished by its means, and it has the additional recommendation of being under the control of a blind person. An appliance for boring the rims of riddles comes next in order, and this not only answers its purpose well, but is a practical proof of Fleming's mechanical skill. The deceased was, we are informed, mainly instrumental in introducing this branch of industry into the Glasgow Asylum, and acted as foreman and teacher in this department until his death.

Electroplating on China. — M. Hansen has recently patented in France the following process for electroplating on a non-conducting material: Sulphur is dissolved in the oil of *Lavendula spica* to a syrupy consistence. The chloride of gold or the chloride of platinum is then dissolved in sulphuric ether, and the two solutions are mingled under a gentle heat. The compound is next evaporated until of the thickness of ordinary paint, when it is applied with the brush to such portions of the china, glass, etc., as are desired to be covered with the electro-metallic deposit. The objects are baked in the usual way before immersion in the bath.

New Steam-Hammer. — A German paper states that the steel works of Frederick Krupp, of Essen, are about to receive a very important addition to their machinery. The largest steam-hammer in use at these works at the present time is one capable of working a mass of steel 50 tons in weight, and erected at a cost of 2,800,000 francs. It is now in contemplation to build a new steam-hammer capable of beating up a mass of steel of double the weight, or 100 tons. The new machine, it is estimated, will cost 5,000,000 francs ($1,000,000) and will be the most powerful in the world, and it may be expected that the size and weight of the German artillery will be enormously increased, as the new steam-hammer will permit the working of larger masses of metal than up to the present time has been thought to be possible by scientific engineers.

The Suez Canal. — The opening of this canal was supposed at one time likely to restore to the Mediterranean ports of France, and especially Marseilles, their old splendor, instead of which most of the steamers prefer to proceed direct through the Straits of Gibraltar, thus leaving the French railways to their own greediness. Nor has the French merchant navy been in due proportion benefited by the opening of the new sea-road to the far East. The French shipping passing through the canal decreases, relatively speaking, from year to year. In 1870, 436,000 tons burthen passed through the canal, of which 289,000 were English, and one fifth, or 84,000 only, French. In 1874 the proportion of French bottoms was found to be reduced to 220,000 tons, or less than one tenth, 2,423,000 tons having passed the canal, out of which 1,797,000 were under the English flag. The other navies, although below the absolute figure for France, are progressing more rapidly. Thus, since 1872, four times more Dutch ships have used the canal, while the increase of the French navigation was only 40 per cent.

PRACTICAL RECIPES.

White Inoxidizable Metal. — M. Marlié gives the following recipe for the production of a white metal which will not tarnish. Iron ten parts, nickel thirty-five, brass twenty-five, tin twenty, and zinc ten parts. When the articles are cast and finished they are heated to whiteness and tempered in a mixture composed of sixty parts of sulphuric acid, ten of nitric acid, five of hydrochloric acid, and twenty-five parts of water.

Copper Amalgam which Adheres to Glass or Porcelain. — To produce this, take from

twenty to thirty parts of copper in powder obtained from the oxide, either by means of hydrogen or by precipitation of the sulphate with the aid of zinc; mix this with sulphuric acid and with seven parts of mercury, and mix all together with great care. The acid must then be washed away with hot water, and the amalgam be allowed to dry. At the end of ten or twelve hours the mass will be sufficiently hard to take a brilliant polish. We are told that while the amalgam becomes soft with heat, it does not contract from the effect of cold.

Gummed Adhesive Paper. — Paper in sheets half of which are gummed on both sides, and the other half on one side, and divided into strips and squares of different sizes by perforations, like sheets of postage stamps, are very convenient in many ways — the doubly-gummed answering for fixing drawings in books, labels on glass, etc. It is stated that the mixture by which it is coated is prepared by dissolving six parts of glue, previously soaked for a day in cold water, two parts of sugar, and three parts of gum arabic, in twenty-four parts of water, by the aid of heat.

To Prevent Splitting of Handles. — All carpenters know how soon the butt ends of chisels split, when daily exposed to the blow of a mallet or hammer. A remedy suggested by a Brooklyn man consists simply in sawing or cutting off the round end of the handle so as to make it flat, and attaching by a few small nails on the top of it two round disks of sole leather, so that the end becomes similar to the heel of a boot. The two thicknesses of leather will prevent all further splitting, and if in the course of time they expand and overlap the wood of the handle, they are simply trimmed off all around.

To Coat Castings with Copper. — The article should first be rendered free from rust by rubbing with an emery cloth, or by dipping into a pickle composed of sulphuric acid 2 oz., hydrochloric acid 1 oz., water 1 gallon. After the article has remained some time in this pickle it should be taken out, and the rust removed by a brush and some wet sand; if the oxide cannot be easily cleaned off, it must be returned to the pickle. As soon as the article is rendered bright, it is washed in a warm solution of soda or potash, for the purpose of removing all grease. Lastly, it is well rinsed in hot water, and immediately placed in a concentrated solution of sulphate of copper, to which a little sulphuric acid has been added. In a short time it will be coated with an even covering of metallic copper.

Pretty Red Dye for Wood. — To 2 lbs. genuine Brazil dust add 4 gallons water. Place the articles, immersed in this liquid, in a suitable vessel, boil them for three hours and let them cool, then add 2 oz. each of alum and aquafortis, and keep lukewarm until the required shade is obtained.

Driving Screws into Hard Wood. — A correspondent of an English journal writes: "Having lately had occasion to screw together two pieces of ebony, I made use of the following dodge, which was perfectly successful. I filed a flat about ¼ in. long on the side of a common wood-screw, commencing at the point. This cut the wood, and formed a thread in the same way that a tap would have done. The screw followed it up and held well. Having previously had difficulty in getting screws to hold in box and other hard woods, I send the above wrinkle for the benefit of my brother amateurs."

A Very Highly Illuminating Oil. — The *English Mechanic* gives this recipe: Pound in a mortar 2 oz. of camphor, slightly moistened with alcohol; add a pint of sperm oil, and stir till dissolved. Light the wick, after being thoroughly soaked, and let it burn for a few minutes; then blow out and re-trim with exactness, in order to secure an even, smokeless flame, which can be better done after the wick has been slightly charred.

Agriculture.

THE FODDER VALUE OF APPLES.

The crop of apples, the present year, in New England is not so large as to suggest the possibility or necessity of feeding them to animals, but nevertheless the question regarding their value as food for animals is an interesting one. In the experiments made with the view of determining this point, the conclusion has been that apples were of little value in themselves as fodder for animals. The fact that they hold so large a percentage of water, usually more than 90 per cent., proves that at best they must be a very attenuated form of food. The almost entire absence of nitrogenous substances in apples proves that they are hardly worthy of attention as a source of animal nutrition. Professor Storer, of the Bussey Institution, has been giving attention to the subject, and the results of his observations and analyses go to corroborate the views we have taken. In a recent publication he remarks as follows: —

The precise significance of apples as food for animals does not appear to have been ever very clearly made out. Though eaten greedily by all kinds of cattle, this fruit is seldom given to them purposely, or in a methodical way; and although it often happens here in New England that horned cattle in particular have access to windfall apples in their pastures, in such wise that they actually consume very considerable quantities of them, there are comparatively few farmers who would deem it good practice to feed out apples to stock as they would feed pumpkins, or turnips and other roots.

It is evident that a certain prejudice against the use of apples as cattle food prevails among farmers almost everywhere. Sometimes the objection is raised that there is "no nourishment in apples;" at other times it is asserted that they are "too sour," and that they will "dry off milch cows." We sometimes hear that they are apt to choke the animals, and at others that the trouble of collecting them would be greater than their worth. Against the last four objections it might be urged that there is manifestly no need of feeding out apples injudiciously, and that we have daily evidence that cattle can eat moderate quantities of this fruit, even the sourest kinds, without injury to their health or their efficiency; that, as with turnips, the risk of choking may be avoided by either cutting, crushing, or cooking the fruit before giving it to the animals; and that, in the case of windfalls, at least, the trouble of collecting the apples would be partly offset by the fact that the process could be made to serve, incidentally, as a means of destroying the grubs in the apples, which have caused them to fall.

As for the question how much nourishment the apples really contain, that can only be answered by way of analysis, and by careful and judicious experiments in feeding animals. But, as analysis shows, the composition of apples is so little like that of the roots and herbs ordinarily used as fodder that it was really no easy matter to try conclusive experiments with them before this composition had been found out. In the absence of any just knowledge of the constituents of a given fodder, it is, of course, difficult to determine what kinds of food should be given in connection with it, in order that its components may be properly utilized by the animals. It is not surprising, therefore, that so many doubts and uncertainties should have prevailed hitherto with regard to the fodder value of this fruit.

The most noteworthy feature in the composition of the apple is the very small proportion of albuminoids that are contained in it, as compared with the amount of carbohydrates. This fact may readily be made manifest by comparing the analyses of the flesh of the apple with the composition of the various roots enumerated in the table on page 387 of Johnson's "How Crops Grow."

Professor Storer suggests that it might be well to mix with the apples "shorts," meal, or some substance containing the albuminoids. He says:

I have myself witnessed, many years since, some highly favorable results, that were obtained by feeding a herd of fifteen or twenty swine with a mash made of the sourest native cider apples, and the meal of mixed peas and oats. In this instance the apples were boiled thoroughly in large kettles, whence they were shovelled into hogsheads, where a small proportion of the meal was sprinkled upon each layer of the hot mass, and left where it fell for a while, in order that it might be cooked, before the whole was stirred to a homogeneous mixture. The oats and peas had been grown together, and threshed and ground as if the harvest had been oats alone. The swine, which were from a year to a year and a half old, had been maintained upon rather short allowance during the summer by means of swill from a tavern, together with what grain and straw they picked up in the manure of the tavern stable beneath which they were kept. The locality was among the foot-hills of the White Mountain range in New Hampshire, where the summer is tolerably short, and where maize, though grown abundantly, costs the farmer rather more in terms of trouble and anxiety than either oats or peas.

When put upon the apple ration, just described, these large and hungry swine not only ate the mash voraciously, but they immediately began to grow with surprising rapidity, and they continued to prosper during the subsequent month or six weeks they remained under my observation. I am ignorant whether the fattening was finished upon the apple ration, or whether the hogs may not finally have been fed for a while upon maize.

Buckwheat bran (not buckwheat husks), a substance tolerably rich in nitrogen, which, according to Johnston, of Durham, is greatly approved of for feeding pigs in certain parts of New Brunswick, is another kind of food which might perhaps be used with advantage in conjunction with apples in some localities.

With regard to the comparative fodder value of apples and potatoes, that can only be determined by competitive trials, in which each of these kinds of food is supplemented by other kinds that are competent to supply the constituents which are lacking in the apples or in the potatoes, as the case may be. From the analyses it would appear that there is actually less food in a pound of apples than in a pound of potatoes. The carbohydrates of the potato, moreover, consist largely of starch, which is a food of approved value. The significance of starch is so well understood almost everywhere at the present time, that its merits are no longer liable to be seriously called in question. But while it is true that the functions and value of starch are known more precisely than those of any of the constituents of the apple, excepting the sugar and fat, it would be wrong to suppose that apples can have no value as fodder because they contain little or no starch; for the pectose, pectin, and allied matters that constitute a large proportion of the carbohydrates of the apple are unquestionable useful forms of food when used judiciously, as well as the sugar that is contained to the extent of from 7 to 9% in apple juice. It is a matter of the commonest experience that pumpkins and turnips and other roots, which contain much pectose, are to be classed as highly valuable forms of fodder; and it has been shown by the experiments of Grouven, that pectin, which had been prepared for the purpose, and administered as such, was completely and rapidly digested by oxen.

In so far as concerns the amounts of starch, pectose, and pectin, which they severally contain, it would be more reasonable to contrast apples with turnips than with potatoes; though, as has been shown already, the remarkably small proportion of nitrogen in the apple distinguishes it clearly from the turnip and allied roots, as well as from most other kinds of fodder.

THE NATURE OF PLANT FOOD.

It is an interesting and important question whether vegetable life is sustained by organic or by mineral food. In another part of this number of the JOURNAL we have referred incidentally to this problem, and have quoted Dr. Alfred Carpenter, of England, in support of the opinion that plants feed on organic matter. He advanced this view in a paper recently read before a scientific association, in discussing the subject of sewage farming. Dr. Voelcker, the chemist of the Royal Agricultural Society, in the debate that followed, took the opposite ground. He remarked that at one time "humus," or the organic matter in soils, was regarded as the terrestrial food of plants, but this humus theory, which has done so much mischief in retarding progress, received its death-blow in the wonderfully clear and most conclusive argumentative writings of Liebig, and he quite agreed with that great chemist. The luxuriant development of the crops usually grown on cultivated lands depended mainly upon the available mineral food present in the soil, and not on its organic matter; indeed, he did not know a single fact which supported the view according to which plants live and grow vigorously upon the organic matters of the soil or manure, and not upon the mineral portion of the soil or the saline and mineral constituents of the manure. It had been established beyond controversy that the really essential elements of plant food were mineral and not organic substances; and he was decidedly of opinion that the constituents of sewage had to become mineralized before they could benefit growing crops. In porous and well-drained soils, and in land readily permeated by atmospheric air, the conversion of organic refuse matters into purely mineral compounds proceeded with great rapidity; and this, by the way, was one of the causes why sewage culture succeeded better on light land resting upon a porous subsoil than on stiff clay soils upon imperfectly drained subsoils. On stiff clay land the decomposition of the animal refuse matter proceeded much more slowly than upon porous, light, and sandy soils. Hence it was that heavy clay land was generally manured in autumn, whilst light land was more beneficially manured in spring; for if ordinary farm-yard manure were to be applied in spring to stiff clay lands, there would not be sufficient time to convert the manure into mineral elements of plant food, and light crops would be the result. On soils not readily penetrated by air, organic matters were positively injurious.

Dr. Voelcker, in proof of his views, referred to the interesting experiments of Boussingault and Lévy, who had shown that the air in a cultivated soil invariably contains less oxygen than the air above it. A portion of the oxygen in fact was consumed by the organic matter in the soil, and its place was taken by carbonic acid, resulting from the combination of the carbon of the organic matter with the oxygen of the air. According to the nature of the soil and the time of the year, and the way in which it had been treated as regards manure, the amount of carbonic acid in the air of the soil may increase to over eight per cent. and that of oxygen recede to less than twelve per cent., and invariably it is less than twenty-one per cent. by volume. For instance, on analyzing the air present in a light, sandy soil, recently manured and after rain, Boussingault and Lévy obtained the following results: —

	By volume.
Carbonic acid	9.74
Oxygen	10.35
Nitrogen	79.91
	100.00

In another sandy soil, unmanured, the air contained: —

	By volume.
Carbonic acid	0.93
Oxygen	19.50
Nitrogen	79.57
	100.00

These experiments show plainly that common dung and similar refuse matters are really burnt up or oxidized in porous soils with great energy, and rapidly converted into mineral plant food. In another experiment the same chemists found in the air in a stiff clay soil: —

	By volume.
Carbonic acid	0.66
Oxygen	20.04
Nitrogen	79.30
	100.00

Here the combustion of the organic matters in the land proceeded more sluggishly; and on such land the produce is generally more scanty than on a porous, well-aerated soil, plentifully supplied with mineral food, amongst which nitrates are to be included.

So much for Dr. Voelcker's views. At another time we may refer more at length to the arguments adduced on the other side of the question.

SALT AND BUTTER.

In a recent letter, Mr. L. B. Arnold, Secretary of the American Diarymen's Association, discusses the influence of salt upon butter as follows: —

Modern investigation has shown that the changes which occur in fermentation and putrefaction are caused by the growth and multiplication of organic germs, — either vegetable or animal, or both, — the germs, to support their own growth, using a part of the substances affected. Salt preserves by counteracting, in both cases, the incipient development of the germs which occasion the changes. The whole power of salt as an antiseptic lies in this fact. It is only in the incipient stage that it has power to preserve. If by any means the germs in either case get a little start, salt is powerless to check them. If a piece of rancid butter, ever so small, is placed in contact with a package of sound butter, it will soon spoil the sound butter, no matter how well salted. Upon the preservation of butter, salt exerts but very little influence. The keeping quality of that luxury depends much more upon other conditions than upon the action of any fancied variety of salt. Butter is subjected to change chiefly by the action of germs which lodge upon its surface from the air, which develop and multiply, and, filling the mass with their presence, work its ruin. Exclusion from the air, therefore, proves a more perfect preservative than salt. When it must be exposed to the air, the grain of the butter, as affected by churning and making, exerts the most controlling influence upon its keeping. Butter is made up of minute granules of different kinds of fats in a state of emulsion, or, if you please, in a state of combination, with a very small amount of nitrogenous matter. Though containing many distinct ingredients, they are so small as to vary from 1-500th of an inch to 1-2000th of an inch in diameter. While whole, they take care of themselves. The germs from the outside air which lodge upon them seldom disturb them, and, failing to gain anything to foster their growth, remain harmless. But when these little grains are broken, and their perfect combination destroyed, and the nitrogenous matter separated and opened to the air, their disorganized contents, like eggs with broken shells, become a ready prey to every contaminating influence the atmosphere may waft along. The principal use of salt in butter is for seasoning, and for this purpose it is only necessary that it should be chemically pure.

MORE ABOUT THE CURRANT WORM.

In my former article on this subject, I referred to my experiment with the currant worms confined in a glass jar, while feeding on the leaves. And it now seems proper that I should give the further results of that and one other experiment I have successfully made, also with the white worm which moults from the green or feeding worm.

In my first experiment all the feeding worms moulted, from which it would seem that all these worms (and not a part, as I at first supposed) go through this process of moulting. And these white worms in the jar went immediately into the pupa state on the bottom of the jar in black cells, fastening to the jar and the leaves, where some of them still remain, while some have come out as flies.

While this experiment was going on, I often witnessed this whole process of moulting on the leaves in my garden. The feeding worm attaches its tail to the leaf, and, raising its head, it gradually opens and the white worm appears. It is tinged with yellow at each end, and works the old skin back with its legs. At first it remains quiet. It does not feed at all. Indeed, all the feeding both for this worm and for the fly that comes from it is done by the green worm upon the leaves.

I took two dozen of these white worms from the garden, and carefully dropped them into a two-quart glass jar half filled with earth, when they immediately went down into the earth, and disappeared from sight, thus proving that they enter the pupa state in the ground. I covered this jar with gauze, and placed it in the shed, out of the light, where I supposed those worms would remain till spring, and was surprised, therefore, when at the end of three weeks I found a number of flies in this jar, and the identical fly that I have so often seen attaching its eggs to the reverse side of the currant leaf. To determine the function of this fly, I took off the top of a new stem of the currant-bush with its leaves thereon, and stuck it down into the earth in the jar, so that it might keep green as long as possible. These flies began immediately, not on the wood of the stem, but upon the leaves, to which their eggs were attached with geometrical precision. And in a few days the real currant worms from those eggs were eating those leaves.

It would seem probable that these flies in my jar came out of the pupa state prematurely. The jar made their condition warmer than the ground is; and some may remain still in the jar to come out next spring. But it is doubtful what became of those flies. I could find only two of them dead on the surface of the earth in the jar. The male is darker and smaller than the female. The abdomen of the latter is yellow when distended with the

ova. It looks so much like the fly which I have cut out of the stems from the borer, that it was quite natural to suppose they must be the same. But similarity does not always prove identity. Albeit there is manifestly an identity of purpose in the two borers I have described and the currant worm, and that is, the utter destruction of the fruit.

LaRoy Sunderland.

Quincy, Mass., *August* 2, 1875.

NOTES AND MEMORANDA.

Potted Hay. — Professor Wrightson of the Royal Agricultural College, Cirencester, writes to the *Times* as follows: "Will you allow me a few lines' space to call attention at this seasonable time of the year to a process of preserving fodder for winter use little known, and, so far as I am aware, never practised in this country? It gives as its product what is known all over the Austrian empire as sour hay, which, I may add, I have seen used extensively on many large estates. The process of making sour hay is not only exceedingly simple, but in the event of a wet season might be adopted in this humid climate with excellent effects, as neither drying wind nor sun is required. The green grass, green Indian corn, or other fodder is simply crammed down into pits or trenches 4 feet wide and 6 feet to 8 feet deep, until it forms a compact mass up to the surface, and the whole is then covered with a foot or rather more of earth, rounded over so as to form a long mound. No salt is used, and the wetter the fodder goes the better. The preservation is complete, and when cut out with a hay spade in winter the fodder is of a rich brown color, and exhales a slightly sour, but, on the whole, agreeable flavor."

Cooked Food for Cattle. — Professor Wilkinson of Baltimore says: "I conducted an agricultural school and experimental farm for eight years, and experimented with feeding cooked and uncooked food of every description used for cows, horses, swine, working and fattening cattle, and poultry, and carefully noted the result, which was in all cases very remunerative; so much so that even with the defective, inconvenient, and expensive apparatus used — for want of better — in steaming, manipulating, and feeding, I found there was an average profit of fully 25 per cent., that is, in feeding the variety of animals named; but in feeding milch cows in cold weather with warmed, steamed food of every description, there was a profit of over 30 per cent. when the animals were kept at proper temperature, and fed with proper proportions of nutritious food."

Water Evaporated by Fruit-Trees. — Advice is given by a German professor to keep in orchards a certain space around the trees free of grass and weeds, as these draw too much water away from the trees; indeed, it has been proved that trees which were sickly and bore little fruit, have been restored to vigorous growth by returning to them the necessary water in this way. To prove how much water fruit-trees need, it may be stated here that an acre planted with them will evaporate in about twelve days 5,000,000 pounds of water.

Valuable Grass Crops. — A Montana paper says: "'Gold from the grass roots down,' is an expression not understood in the States, and yet some of the richest placer diggings worked in Montana were of this description. We have got $2.50 to the pan by pulling up the grass roots on Carpenter's bar, Blackfoot, and washing them, and we have seen $5 washed from a pan of grass roots pulled off the rim of Harris's hill, below Bannock. The gold was coarse, and in both cases the grass roots reached the bedrock. Thousands of miners have worked diggings of the kind known as gold from the grass roots down."

Boston Journal of Chemistry.

Jas. R. Nichols, M. D., *Editor.*
Wm. J. Rolfe, A. M., *Associate Editor.*

BOSTON, SEPTEMBER 1, 1875.

LIQUID CARBONIC ACID.

It is difficult to conceive how the invisible gas which renders a glass of soda water brisk and sparkling can be made solid or liquid, so as to be readily handled. It is perhaps fortunate that one of the gaseous or aeriform bodies can be without much difficulty put into this condition, as it serves the purpose of proving the physical nature of bodies which in their ordinary condition are invisible or intangible to the sense of sight. If carbonic acid gas can be made to assume a solid form, why cannot the other gases be manipulated so as to obtain like results? It is probable that they may be, as our knowledge of the properties, physical and chemical, of these forms of matter increases. This knowledge is at present very imperfect, and we have much to learn regarding what matter really is. The utility of experiments is now regarded as of the first importance, and when it is asked, What good can come from changing the physical condition of a gas? the answer is ready: We thereby obtain a motive power which may perhaps be of vast service in promoting the industries of the world. A pound of liquid gas has stored up in itself a tremendous energy. It is like a coiled spring which is struggling with the strength of a giant to get back to its normal or usual condition. If we can control its changes, and turn its power in a direction consonant with our will, we have secured an agent in a most compact form capable of performing extraordinary service. The elastic force of the liquid gas, at the temperature of our warmest summer weather (about 90° F.), rises to the enormous point of 1200 lbs. to the square inch. If we can contrive vessels strong enough to hold the liquid, we can carry in one no larger than a gallon measure the power, for a limited period, of a mighty steam-engine. The liquefaction of the gas is comparatively an easy process when small quantities are wanted, and recent experiments at the United States Torpedo Station, Newport, R. I., as we learn from a paper recently published by Mr. Walter N. Hill, seem to prove that apparatus has been devised by which it can be safely and economically made upon a large scale. It has been thought by those in charge of the station that the liquid gas might be employed in rendering torpedoes effective, and the experiments made afford ground for much encouragement. A torpedo has been contrived, called Lay's torpedo, which carries this gas, but the difficulty has been to construct vessels of metal sufficiently strong to hold it. The tension is so enormous, even at low temperatures, that iron tubes of an inch in thickness are shattered as if but pottery. By the use of steel plates, peculiarly arranged and soldered, vessels of vast strength have been constructed, and the gas held in abeyance until released to do its desired work in propelling the destructive torpedo. It is supposed that this will be of great service in naval warfare, and prove an agent capable of destroying vessels of the largest size almost instantly. If thus it should be found effective in the propulsion of torpedoes, there is good reason to believe it will prove of service in the more peaceful arts. We have always regarded the agent as one of great promise, and our experiments with it have been numerous, extending over a period of nearly a third of a century. The first apparatus in this country for liquefying the gas was constructed under our direction, and thirty years ago it had safely performed its work more than fifty times. The ease, facility, and cheapness with which carbonic acid gas can now be produced certainly render it a very interesting and promising agent, to be utilized not alone for the destruction, but for the welfare of the race.

WHOLE WHEAT FLOUR.

Since we called attention to the important matter of securing good sweet flour made from the soundest wheat unbolted, we have received a large number of communications from millers and dealers in all parts of the country. It will be remembered we stated that it was almost impossible to obtain from dealers in towns and cities this flour in satisfactory condition, it being ground from the poorest wheat, and sold under the name of "Graham flour." The article to which we allude was quite extensively copied, and hence it fell under the notice of mill men and flour factors in nearly every State of the Union; and although it subjected us to considerable annoyance, this is of small consequence if through the agitation of the subject the market is supplied with better and wholesomer whole wheat flour. It is curious to consider the nature of the communications made by our correspondents. Not one of them denies the truthfulness of the general statement regarding the practice of millers in grinding into "Graham meal" the poorer qualities of wheat, and several make statements which, if true, prove the practices of millers to be more reprehensible than we supposed. They all, however, allege that they themselves make whole wheat meal of very superior quality, and to prove their assertions true send specimens of their products. So many have come to hand, that the paper bags, packages, boxes, and buckets lumber up the office, in a way to make locomotion difficult.

Now, we have to thank all these honest millers and dealers for valuable specimens of their products, but the requests that we will "try" them in our family, or notice them in the Journal, can hardly be complied with. Our digestion at present is tolerably good; we cannot jeopardize it by trying experiments.

A small specimen of good flour sent for examination does not prove that the manufacturer always makes good products, any more than small specimens of good fertilizers sent for analysis prove that the makers' ordinary goods are always reliable.

The proper course for manufacturers to pursue is to commence to grind into fine flour wheat which has been carefully selected and cleaned, and give to the production of dark whole wheat flour that careful, competent, honest attention which is given by some makers of choice brands of white flour. Now, have the name of the maker put upon every package of this flour, state also where it is made and its extra quality, and it will not be long before a *reputation* will be gained which will be a fortune to the miller. It does not take a very long while for consumers to

find out who makes good articles of food, and the *confidence* of purchasers is worth having. In what has been said, we do not wish to be understood as condemning all the dark flour of manufacturers. It may be that some have uniformly ground good wheat into unbolted flour, but if so, their products have been lost in the general mass of bad meal found in the market.

We will state here that to meet the difficulties under consideration, we have for several years, when not using flour made from wheat of our own raising, bought the best white flour in the market, and, to secure all the nutrient principles of the grain, have added to it in the process of bread-making cleaned "fine feed," in the proportion of one part of the latter to four of the former. This makes excellent, wholesome bread. The "fine feed" is next the outside covering or envelope of the wheat berry, and contains the important phosphatic and nitrogenous principles. It is "bolted" out in the process of flour-making, and sold for feeding animals. The article used by us is made by a flour manufacturer in Lawrence, Mass., and the "feed" is specially selected and cleaned for purposes of bread-making.

MILK.

BY S. P. SHARPLES, STATE ASSAYER.

Milk seems to be attracting a great deal of attention both in this country and in Europe, and the controversy between the producers or milkmen on one side, and the consumers or chemists acting in their interests on the other, has become exceedingly active.

The chemists, with only a few exceptions, have followed Mr. Wanklyn, and considered any milk that fell below the standard of twelve and a half per cent. of solids, and nine and three tenths per cent. of solids not fat, as adulterated. And it has been generally easy to secure conviction before the courts on these figures. Recently, however, Dr. Voelcker, the well-known chemist of the Royal Agricultural Society, and Dr. Stevenson Macadam have disputed the correctness of this view, and have made and published analyses of milk that seem to prove its incorrectness.

In looking over books of chemistry we generally find that some old analyses by Chevalier and Henry are the only ones given, and the text would lead one to think that milk was a very uniform fluid. This is far from being the case, as the two following analyses, made within a few days of each other, of milk drawn from different cows, will serve to show. The cows were both of native breed; that is, they had slight admixture, if any, of imported blood, but were ordinary cows, such as may be met with on the majority of farms in this section of the country.

Table I.

	No. 1.	No. 2.	Difference.
Specific gravity	1.030	1.033	+.003
Cream	18.	5.5	—12.5
Total solids	15.11	11.94	—3.17
Solids not fat	8.94	10.33	+1.39
Fat	6.17	1.61	—4.56
Ash	.65	.71	+.06
Sugar	5.11	4.73	—.38

These two specimens were known to be pure and not tampered with. In two separate cases within a few months, in examining milk known to be pure, I have found the solids falling below 12 per cent. by weight in weight; and in six cases out of twenty the solids not fat fell below nine per cent. In order to give as full a view as possible of these variations as found by different chemists, I have collected from every available source quite a number of analyses of milk. These have been made in different countries, and at different times, and in almost every case represent the average of a large number of analyses. I have given here only the total solids, solids not fat, casein, and ash, as these seem at present to be the data most relied upon. They are arranged in the order of total solids.

Table II.

	No. Specimens.	Solids.	Not Fat.	Casein.	Ash.
J. F. Babcock	8	14.55			.88
S. P. Sharples	22	14.49	9.61	4.13	.66
Vernois and Becquerel	46	14.24	9.73	4.86	.65
Goppelsroder	60	14.13			
H. W. Vaughan	58	14.08	10.07	4.99	.75
Lebert		14.00	9.75	5.50	.75
Letherby		14.00	10.10	4.10	.80
Playfair	9	13.49	8.61	4.17	.55
Dr. Phipson		13.33	8.46	3.76	
Chevalier	2	13.23	10.31	3.98	.78
Wanklyn	3	13.12	9.36	4.56	.72
Cameron	40	13.00	9.00	4.10	
Chevalier and Henry		12.98	9.75	4.48	.60
A. Muller	Many	12.85	9.43	3.42	.72
Boussingault	9	12.71	8.80	3.47	.25
Haidlen		12.70	9.70	4.82	.49
C. F. Chandler	1700 qts.	12.55	8.72	3.88	.76
Macadam	66	12.27	9.69		.71
Voelcker	22	12.10	9.15	2.93	.83
Von Baumhauer	162	11.30	8.45		.72

It will be seen that the milks from the vicinity of Boston head the list, while those reported by Mr. Vaughan of Providence, R. I., are not far behind. Yet while we average so high, I found in the course of my analyses some samples almost as poor as any reported, the one mentioned in Table I. being one of these. It has been generally taught that the food of the cow has but little influence on the quality of the milk, merely affecting the quantity. Dr. Voelcker found that this notion is erroneous. He found that feeding the cows on rich food in the evening after they had been all day on a poor pasture produced a marked change in the milk solids, the evening's milk only giving 9.7 per cent. while the morning's mile gave 12.4 per cent.

In Table III. are shown the limits of variation as found by different observers. It will be seen that these limits are quite far apart. Dr. Voelcker has reported the lowest case so far as known, and most of the 22 samples reported by him, as well as the 162 reported by Von Baumhauer, are certainly to be regarded as very poor milk.

Table III.

	Total Solids.		Solids not Fat.	
	Highest.	Lowest.	Highest.	Lowest.
Dr. Voelcker	14.00	9.3	9.88	7.51
Dr. Macadam	14.54	10.57	11.23	8.74
Von Baumhauer	13.23	10.18	8.93	8.08
Vernois and Becquerel	19 68	11.70	10.56	7.73
Vaughan	16.96	12.85	11.14	8.79
Sharples	19.34	11.64	11.42	7.88

DAIRY SCHOOLS IN DENMARK.

Dairy produce, especially butter, has of late years assumed considerable importance in Danish industry, and one result has been the institution of schools, under government patronage, for practical instruction of the country youth in the best methods of making butter and cheese, and other operations of the dairy. There are six such schools at present in Denmark, and all prosperous. To take one in the Island of Zeeland as an example, M. Svendeen, at the head of it, is assisted by three professors and his wife. From September 1st to November 1st the establishment contains only girls, from November 15th to August 1st only lads, both classes entering the school at fifteen to eighteen years of age. They pay about ten dollars a month for their board and education. The instruction is both practical and theoretical. For two or three hours daily they receive lessons in the keeping of accounts, dairy management, and natural history; they are instructed in the physiology of milch cows, the action of the mammary glands, the food of cattle, etc.; and in the afternoon some time is given to music and singing. The greater part of the mornings, however, is devoted to practical work in the dairy, where the students are distributed to their allotted tasks of milking, making butter, cleaning utensils, preparing rennet, etc. About 400 to 500 litres (or quarts, nearly) of milk are treated daily, all the operations are carefully explained, and the establishment is provided with the newest and best apparatus for dairy work. The students entering these schools (M. Svendeen has about forty yearly of either sex) are chiefly sons and daughters of farmers and proprietors. They come with a good previous education, and generally leave the school with a real enthusiasm for its pursuits. The success of the system is such that many applicants have to be refused admission every year. Norway and Sweden are following the example of Denmark.

CONGELATION.

While I was a student at the Iowa Agricultural College, and assistant in the chemical laboratory, some facts illustrating the principle that liquids confined from the air may be reduced much below the freezing point in temperature without congealing came to my notice, and I deem them worthy of record.

We usually bottled the reagents used in analytical work as soon as the term closed in November, and transferred them to a warm room for winter, but upon the fall in question the solutions, in glass stoppered bottles, were left in the dispensing room until the mercury stood below zero. The solutions, among which were chlorides of calcium and barium and ferrocyanide of potassium, showed no evidence of solidification, and were perfectly clear until the air was admitted, when they instantly congealed. The solutions were quite dilute, hence it could not have been crystallization due to disturbance. Another instance equally striking occurred the same fall. We received a dozen bottles of mineral water from the magnetic springs of Michigan for analysis; they were placed under one of the chemical tables, and remained there until the weather was several degrees below zero. Upon examination, ten of the twelve bottles were found broken, the water frozen, the ice retaining the form of the bottle. Some showed that the stopper had been blown out by the pressure, and congelation had taken place rapidly enough to throw the pieces of glass to some distance. The water in the other two was unfrozen, and the bottles were removed to a warm room and in a short time opened without suffering injury.

F. L. Harvey.

Humboldt, Iowa.

EDITORIAL NOTES.

Astrology in England. — At a recent coroner's inquest in London, a "professor of astrology" was summoned as a witness. He had been called in to see the deceased, who was shown by terrestrial medical evidence to have died of tubercle of the lung, and told him that his "liver did not throw blood," and that it would be like "rising him from the dead" to get him right again, but he would try. He sent him pills and medicine composed of seven different herbs which he enumerated, which the man, we suppose, took, and thereupon died without further delay. Mr. Bigwood, the astrologer, told the court that he "worked on the botanist scale through astrology, the herbs being governed by the sun." He used a hundred different herbs in the course of his treatment of his patients, and he "gave medicine according to every part of the body." So successful was he in his profession, that "if a

person was in London and he knew the date of their birth, though he was at Corsham, he could tell where their complaint was and what medicine to give them." The deceased, it seems, was not born "when the sun was in opposition sign to the stomach, but when the sun stood in afflicting sign to that part of the body." From this it necessarily followed that "the deceased's liver could not act properly." There is, however, one point in Mr. Bigwood's system which is specially worthy of note. By "watching the movements of the heavens" he could tell when to get his patients to call in a medical man. "It is to be regretted," says the London journal from which we take these facts, "that Mr. Bigwood does not seem to have watched the heavens sufficiently closely in the present case; and we recommend him to pay special attention to this part of his science if he wishes to avoid what the jury told him he had narrowly escaped in this instance, a commitment for manslaughter. In the mean time interest should be made to obtain him the post of resident medical officer at a lunatic asylum."

"Wheels within Wheels." — Bajazet was prevented by a sudden attack of gout from carrying out his threat to give his horse a bushel of oats on St. Peter's altar at Rome, whereupon Gibbon characteristically remarks: "The disorders of the moral are sometimes corrected by those of the physical world, and an acrimonious humor falling on a single fibre of one man may prevent or suspend the misery of nations." A more striking instance of "wheels within wheels" may be cited from the same historian when describing the irruption of the Tartars into Europe in the first half of the thirteenth century. The maritime population of the shores of the Baltic were deterred by their fears of the Asiatic barbarians "from sending as usual their ships to the herring fishery on the coast of England; and, as there was no exportation, forty or fifty of those fish were sold for a shilling. It is whimsical enough that the orders of a Mogul Khan, who reigned on the borders of China, should have lowered the price of herrings in the English market." Not more whimsical, however, than the connection between the importation into Dundee of jute from Bengal and the revival of the whale fishery in Baffin's Bay, so clearly shown in the last parliamentary statement exhibiting the moral and material progress and condition of India. The bulk of the whale-oil brought into Dundee is required, it seems, for the purposes of the jute manufacturers. "Thus the port of Dundee has now become the centre of the whale-fishing trade, and cargoes of oil from the Arctic regions may be seen discharging alongside cargoes of jute from Calcutta, both being essential to the prosperity of this industry. The Dundee Chamber of Commerce has represented that an Arctic expedition is desirable, in order that new haunts of oil-bearing animals may be explored; and if an Arctic expedition will benefit the jute manufacturers of Scotland, it is equally important to thousands of industrious Bengal ryots, to whom jute cultivation gives employment and the means of subsistence."

Recent Improvements in Vienna. — Most of our readers doubtless know on what a vast and magnificent scale Paris has been virtually "reconstructed" in the last twenty years; and London, with its Thames Embankment and other grand works, has done almost as much in improving and beautifying itself. But Vienna, with her old city fortifications turned into one splendid boulevard, may be fairly said to have outdone other capitals in material reforms. The most important of all these is the work lately opened in state by the emperor, the new arm of the Danube, forming, in fact, a gigantic ship canal, with spacious docks and quays branching from it, to supersede the devious and narrow streams of the river which conveyed the traffic before. The quays thus erected will when complete be very nearly ten miles in length; and this although nearly 3000 acres of building ground are added to the city by getting rid of the old passages of the water, which were constantly shifting their banks where not built in. A so-called winter harbor of eighty acres in extent is being formed at present, to be followed by two lesser basins, giving ample accommodation for the river trade, which of late has been seriously cramped for want of wharfage. The canal is spanned by six substantial bridges connecting the city with the new quarter now rapidly rising. The estimate for this great work was twelve and a half millions of dollars; and this sum is raised by a loan borne in equal shares by the empire, the province of Lower Austria, and the city itself, which are to be taxed for the interest and for a sinking fund to pay the principal off in fifty years.

ATOMS.

The astronomical instruments sent by the French Academy to China for use at the transit of Venus are to remain at Pekin, and perhaps a permanent observatory may be established there. — The Cincinnati Society of Natural History has received an absolute and unconditional bequest of $50,000 from Mr. Charles Rodman, of that city. — Russia has 11,576 miles of railway, 1160 miles having been opened within a year. — A canoe twenty feet long, made out of the trunk of a mahogany tree, is one of the curiosities exhibited at the Maritime Exhibition in Paris. — In the Canary Isles, after the vine ran out, and "good canary wine" was known no more, they took to raising cochineal, and now that the soil has been exhausted for that crop, they are cultivating tobacco, which is said to be the finest in the world. — One third of the population of the Fiji Islands have perished in the late epidemic of measles. — The German army has attached to it a railway battalion composed of artisans and others acquainted with the construction of railways, and for the purpose of keeping the men familiar with their work a short line has been built from Berlin to the new artillery shooting ground at Lossen, which is run entirely by members of this force. — Official statistics show that insanity is rapidly increasing in Great Britain; the number of lunatics, idiots, and other persons of unsound mind registered on the 1st of January, 1875, being 63,793, or 1766 more than at the same date in 1874, and about double what it was seventeen years ago. — According to Mr. Galton, country boys of fourteen years, in England, average one and one fourth inches more in height, and seven pounds more in weight, than city boys of the same age, as shown by the examination of a large number of boys in country and city schools. — In the Zoölogical Garden at Paris a big seal, of the sort called sea-lion, has distinguished himself by saving the life of a little boy who had tumbled in, and could not get out because of the high edge of the basin; the seal held him up with his teeth till help came. — A plague of grashoppers has visited the neighborhood of the Lake of Bienne, in Switzerland, and has caused great devastation to the crops. — Fourteen hundred young Americans are prosecuting their studies at the universities and colleges, music schools and conservatories of Germany. — During the last fifty years the water level of the rivers Elbe and Oder has fallen 17 inches, that of the Rhine 24, that of the Vistula 26, and that of the Danube as much as 55 inches at Orsova; and there is a similar decrease in the water supply from springs in Germany. — Library catalogues are not usually very entertaining reading, but the bulletins issued by Mr. Winsor, the accomplished superintendent of the Boston Public Library, giving lists of the new books added to the library, always contain much matter which is as interesting as it is valuable, both to the student and to the general reader. — In reply to an inquiry, we would state that the entertaining and well-illustrated description of Watkin's Glen, by "Porte Crayon," appeared in *Harper's Magazine* for June, 1871, not 1873, as stated in another journal. — A valuable series of papers on Shakespeare, by D. J. Snider, is appearing in *The Western*, a monthly periodical published in St. Louis. — The monster guns made at Woolwich, England, ranging from thirty-five to eighty tons in weight, seem to be considered by the best authorities as a failure. — The good resultants of systematic training in hygiene, under the direction of a regular professor, are shown at Amherst College by the fact that, according to a record kept for the last fourteen years, there is a large and constant decrease in sickness from the beginning to the end of the college course, the freshmen being always the most sickly, and the seniors the most healthy class. — It is stated that a single English firm has built no less than sixteen thousand bridges for railways in British India. — There is an interesting illustrated account of the South Kensington Museum in *Harper's Magazine* for September; also another of the admirable papers on "The Stone Age in Europe." — According to a recent French writer, a decoction of logwood has strong antiseptic properties, arresting fermentation at once, or preventing it if it has not begun. — About 130,000 pounds of bromine are annually manufactured in this country, almost exclusively in the Ohio and Kanawha valleys; about one pound of bromine is obtained from thirteen bushels of salt. — The London market gardeners pay $200 per acre yearly rent for the land they cultivate, and their average profit amounts to $500 per acre.

LITERARY NOTES.

Messrs. Hurd and Houghton have just published *How to Live Long*, by Dr. W. W. Hall, a collection of "health maxims, physical, mental, and moral." Like all of Dr. Hall's books it contains much sensible and practical advice on hygienic topics, clearly and pointedly expressed. These "health maxims" are detached paragraphs, from a single line to a couple of pages in length, and over 1400 in number. They are not arranged according to subjects, but a full index enables one to find what he wants. Some of them (as for example 514, which tells how many persons certain great churches will hold) have no obvious connection with health, but these are exceptional. We note a few errors on scientific subjects, as in 1097, which reads thus: —

"One of the discoveries of spectral analysis is, that in the warming sunshine there is iron and lime and magnesia; the iron to enrich the blood, and give to the pallid cheek the hue of health; the lime to strengthen tooth and bone; the magnesia to meet many of the wants of many of the tissues; hence they are healthiest who most court the blessed outdoor sunshine."

There is no doubt as to the beneficent influences of the sunshine, but of course it is not true that there is any iron, or lime, or magnesia in it. The spectroscope shows the presence of iron and other metals in the gaseous envelope of the sun, but they are not transmitted to us in his beams. These little slips do not, however, detract at all from the practical value of the author's counsels, which, as we have said, are usually judicious.

The same publishers issue *The History of our Country*, by Mrs. Abby Sage Richardson, which is not inaptly designated as "the book of the centennial." The epoch certainly demanded just such a record, a readable, popular account of the first hundred years of our history, a happy mean between Bancroft's ten volumes and the brief compendiums made for school use. The want could hardly be better supplied than by this handsome octavo of six hundred clearly printed pages, covering the entire history of the country from its discovery by Columbus down to the present year. It is no hasty compilation, but the result of years of careful and skilful labor. Both in matter and in style it is all that could be desired as a standard household narrative of our national history. It is rendered more attractive by its illustrations, which are more than two hundred and forty in number, and excellent in design and execution. The book is in all respects worthy of the Riverside Press, which is no trivial commendation. It is sold only by subscription, and ought to be a "taking" book in that line of business.

The Harpers will soon publish *Select Poems of Oliver Goldsmith*, edited by W. J. Rolfe, A. M., uniform in plan and style with his edition of "The Merchant of Venice" and other plays of Shakespeare. The critical and explanatory notes will be fuller than in any former edition of the poems, English or American, and the book will be handsomely illustrated.

That bright little magazine, *Wide Awake*, commended in our last number, has been added to our "Clubbing List," and will be furnished *with the* Journal at the low price of $2.50 a year.

Medicine and Pharmacy.

SALICYLIC ACID.

This new antiseptic agent, of which we gave a brief account several months ago, continues to attract much attention in medical circles, especially in Germany, where its therapeutical action, both as an internal and as an external remedy, is being carefully investigated.

Administered internally in septic fever, it was found by Dr. Fürbinger to have marked antipyretic powers, the temperature falling very perceptibly in from two to six hours afterwards. Dr. E. Butt has employed it in typhoid fever, erysipelas, and acute articular rheumatism, with very good results. He is inclined to place it on a level with quinine as an antipyretic. He has noticed no disagreeable effects from it in any case.

For external use it cannot wholly supersede carbolic acid, but its superiority to that agent in many cases is remarkable. Drs. Vajda and Heymann, in an article in a Vienna journal on organic disinfectants, report that while the continued use of carbolic acid brings on such local symptoms of reaction as burning sensations, rise of temperature, and redness, none of these symptoms were produced by the use of salicylic acid under precisely similar circumstances. Even in a case where the cavity of a large abscess had been repeatedly washed out with a two and a half per cent. solution of salicylic acid, much of the fluid necessarily remaining in the cavity, no disagreeable effects were produced. Neither have any of those general unpleasant symptoms been noticed, such as headache, feverishness, and the like, which are observed after long-continued use of carbolic acid. In dressing large superficial wounds with salicylic acid no unpleasant general effects have been observed, although the fact of its absorption is fully established. In markedly infecting wounds salicylic acid is useless, while carbolic acid neutralizes their effect. This is probably due to the cauterizing influence of the latter agent, since when used in a diluted condition it is likewise found to fail.

Thiersch finds that granulating wounds upon which a solution of one part to three hundred has been sprinkled show no signs of inflammatory reaction. If after the acid has remained in contact with the granulations for some time these become covered with a white film of precipitated albumen, the healing process still goes on as usual underneath. Sprinkled upon gangrenous or other foul surfaces in substance, salicylic acid deprives them of odor, and by occasional renewal the deodorization may be maintained indefinitely. When, however, there is a thick body of putrefying tissue, the acid cannot of course penetrate deeply enough to insure the absence of all smell.

The advantages of salicylic acid may be concisely stated as follows: —

1. It is antiseptic.

2. It is odorless. This is a double advantage, for not only does it make the application of the remedy much more agreeable, but the limit of its effect can easily be measured when it is used in foul-smelling discharges, and the amount to be employed may be regulated accordingly.

3. It is non-irritating when applied to the skin, to wounds, or to granulating surfaces.

4. It is not poisonous when absorbed into the circulation.

In reply to inquiries as to where salicylic acid may be obtained, we would state that Messrs. Billings, Clapp, & Co. are now prepared to furnish it.

OVERWORK.

Dr. Samuel Wilks, physician to Guy's Hospital, in the *London Lancet*, takes ground in opposition to the popular opinion that society at large is really suffering from an amount of work, physical and mental, which is injurious. He believes that, on the contrary, if both sexes be taken, the opposite is nearer the truth, and that more persons are suffering from idleness than from excessive work. Medically speaking, he sees half a dozen persons suffering from want of occupation to one who is crippled by his labors. He has, therefore, very little sympathy with the prevalent notion that nervous and other diseases are due to overwork. Among girls, so far from studies or other work being injurious, he has known many cases of restoration to health on the discovery of an occupation. Very often, when a business man complains of being overdone, it may be found that his meals are irregular and hurried, that he takes no exercise, is rather partial to brandy and soda, and thinks it not improper to half poison himself with nicotine every night and morning. But we will let Dr. Wilks speak for himself on this subject. The following is a portion of his article: —

"When the man of business presents himself, with his nerves really overstrained, he is found to be a man of delicate or actually insane temperament. The rule, however, is that when a patient comes before me with his nerves unstrung, hypochondriacal, and goes through the whole machinery of his body to inform me of its working, previously committing all the facts to paper lest an important one should be forgotten, that man is getting rusty from having no occupation. . . . We forget sometimes what a formidable machine is the animal body, with its force-producing nervous system. The brain is an engine of many horse-power; its energy must be accounted for in some way; if not used for good purposes it will be for bad, and 'mischief will be found for idle hands to do.' It is fortunate that, with many girls, the frivolities of life keep them idly busy, and so, having a safety-valve, they are harmless to others and themselves; but let a girl occupy herself neither with what is useful nor with amusement, she falls into bad health, she becomes a prey to her own internal fires or forces, and every function of her body is deranged, as well as her moral nature perverted. Cases of this kind appear to me of the commonest order, and at the same time very difficult of cure, because the mother's aid can rarely be gained to assist the doctor; but, on the other hand, her sympathies too often only foster her daughter's morbid proclivities by insisting on her delicacy and the necessity of various artificial methods for her restoration, as well as her resistance to the doctor's advice for a more natural life, since she is sure it cannot be undertaken. Her daughter is too delicate for any of the occupations or modes of exercise proposed. What she requires is medical attendance, and to be alcoholized and physicked. It is remarkable, however, what a young lady can do under the power of a stimulus; as, for example, a gentleman lately expressed his surprise to me how his daughter, who could not walk many yards for a long time, owing to a pain in her back, was soon able to walk many miles a day when she procured the support of her lover's arm. It is from considerations of this kind that, when the superfluity of women, amounting to half a million, doomed to be unmated, ask for employment, I cannot deny it to them. The human body is made for work, physical and mental. The amount it can do is of course proportionate to the power of the machine; but, unlike all other machines, its strength is only maintained by use, as assuredly it rusts and decays by disuse. Just as the muscles are better prepared for work by previous training, so the nervous system, whether it be the brain or spinal cord, becomes more energized by use. If healthy and vigorous persons be taken, there appears no absolute necessity for rest at all, in the popular sense of the term. The rest required is gained during sleep, during meals, and in necessary healthful exercise. It is only during sleep that the brain is actually inactive, although even then not absolutely, for at meals cheerful conversation keeps the mind employed, and even in our walks the attention is fixed on objects around. In times so occupied there are many persons whose minds are never idle, and who yet live to a good old age. Practically they have no rest, for when one object of study is complete, they commence to pursue another. It is by the happy faculty of diverting the powers into different channels that this is accomplished. Instances might easily be quoted of statesmen, judges, and members of our own profession who know no absolute rest, and who would smile at the suspicion of hard work injuring any man. I make it a custom to ask young men what their second occupation is — what pursuit have they besides their bread-earning employment. Those are happiest who possess some object of interest, but I am sorry to say there are few who find delight in any branch of science. The purely scientific man finds his best recreation in literature or art, but even in intellectual work so many different faculties are employed that a pleasant diversion is found in simply changing the kind of labor. For example, a judge after sitting all day, and giving his closest attention to the details of the cases before him, may yet find relief in his evenings by solving problems in mathematics. The subject of overwork, then, is one of the greatest importance to study, and has to be discussed daily by all of us. My own opinion has already been expressed, that the evils attending it on the community at large are vastly overestimated; and, judging from my own experience, the persons with unstrung nerves who apply to the doctor are, not the prime minister, the bishops, judges, and hard-working professional men, but merchants and stock-brokers retired from business, government clerks who work from ten to four, women whose domestic duties and bad servants are driving them to the grave, young ladies whose visits to the village school or Sunday performance on the organ is undermining their health, and so on. In short, in my experience I see more ailments arise from want of occupation than from overwork, and, taking the various kinds of nervous and dyspeptic ailments which we are constantly treating, I find at least six due to idleness to one from overwork."

THE DAILY BATH.

In a paper on the Means of Preserving Health, written for the London *Sanitary Record*, Dr. H. I. Bowditch, after urging the importance of keeping the skin scrupulously clean and in a healthy condition, especially in cases where there is a predisposition to consumption, adds the following practical suggestions with regard to bathing: —

Daily bathing, then, of some kind, from childbirth to old age, should be the rule. Some direct that the cold bath should be always used. I cannot think that this is a true doctrine. With a few children, and still fewer old persons, and very many

adults, a morning cold bath is the most refreshing and exhilarating of operations. But with many either feeble adult, old, or too young persons, a chill remains for some time after taking the bath, and the powers of life are exhausted instead of being invigorated by the stimulus. But those who suffer from cold bathing will usually be able to take with great advantage a daily tepid bath, and without the least chill or discomfort following it. Each individual arrived at years of discretion should judge for himself which of the two to choose. At certain periods of life he may use one or the other, and be himself the judge as to the continuance of the one or the other by the effect left upon him. The parent, of course, will notice the effect upon the child and decide accordingly. But there are various kinds of baths. The *shower-bath* is rarely used now. If used at all it should be so cautiously. *Sponge-bathing* is admirable, with either warm or cold water, according to circumstances of each case. But even this cannot be borne by many. A simple hand bath, *i. e.*, where the water is borne by the hand of the bather to various parts of the body, and the same hand or a warm towel used for friction afterwards, is often infinitely refreshing when other methods fail of being so. *Surf-bathing* should be very cautiously indulged by all predisposed to pulmonary difficulties. Cough of a permanent nature has been at times started by incautious surf bathing or any cold water, sea, or river bathing, especially if the body be immersed for a long time. One of the most striking cases of consumption I ever had was distinctly traceable to a very long and cold river bathing. Hence we see that bathing, like every other good thing, if used immoderately, tends to cause evil rather than good.

It may be asked, If cold bathing be ever evil in its tendencies, how happens it that the "water-cure," so called, proves at times so good a thing? The answer is briefly this. A man once fairly "packed in a cold wet sheet" becomes in a very few moments bathed in a profuse warm perspiration. But the water-cure, used incautiously by persons who are not aware of its power or proper mode of application, becomes destructive and not restorative. One of the severest forms of inflamed lung, and which lasted for months, threatening consumption, and which would probably have proved such in an older person, I saw in the case of a little girl whose mother undertook to cure a violent fever by bathing her two or three times in one night in cold water drawn from a well in the country-house at which they were stopping. The general rule therefore is, bathe daily, but choose that method which proves immediately grateful to the patient, and let all consumptively inclined patients beware of long-continued surf or seashore or river bathing.

DANGER IN USING ETHER AT NIGHT.

Dr. Wm. Hunt, in the *Philadelphia Medical Times*, suggests that in using ether at night, the lights should always be above the operator and etherizer, and the neighborhood of a low grate or open stove should be carefully avoided. The vapor of ether is very heavy, and falls rapidly, as any one can prove by pouring a little of the liquid into a saucer and watching it roll and fall over the sides. Dr. Hunt says that one of the most exciting and seriously threatening scenes he has ever been engaged in, happened in the following way: —

A man required amputation of the arm (which was crushed by an engine) high up. There was, fortunately, just room for the tourniquet. The residents of the hospital, together with Drs. Agnew and Herbert Norris, were assisting. The latter administered the ether from a large sponge, and placed the bottle on a chair at his side. I had just removed the dangling fragments of the limb, when an assistant brought a candle close to the stump, and almost directly under the sponge. Instantly we were in a blaze. Dr. Norris involuntarily started back, and, in doing so, knocked over the chair with the large ether bottle, which broke! Its contents were quickly spread, and the whole ring of the amphitheatre was on fire. A nurse lifted the patient from the table and placed him on the floor. Fortunately, the tourniquet held. Others sprang into the side wards and seized blankets, coats, and anything at hand, and we soon stamped the fire out, but were all more or less singed. The walls of the amphitheatre bore evidence for a long time, in the scorched wood and blistered paint, of the danger. The exposed parts of the patient were superficially burned, but he never knew what had happened. He was placed on the table, and the operation was finished. The thorough anæsthesia here was fortunate for all. Had the fire taken place earlier, terror and excitement from ether combined would have made the man uncontrollable, and a fearful panic might have occurred in the hospital. As it was, no alarm was spread beyond the room."

Night operations with ether should, therefore, be only those of absolute necessity, and with the cautions enjoined there need be no danger.

NEW PROCESS FOR SYRUP OF TOLU.

Mr. R. Rother, in the *Tennessee Pharmacal Gazette*, after describing at length the difficulties connected with the ordinary process of preparing the syrup of tolu, states that he has devised a most expeditious and effective method, whereby alcohol and magnesium carbonate are excluded, filtration avoided, and a highly fragrant yellowish-green and perfectly clear and transparent syrup is obtained. When balsam of tolu is heated for a short time with water containing a small quantity of ammonia, a solution results which, on the addition of an acid, gives a voluminous white precipitate of cinnamic acid; probably this indicates that ammonia can be used to advantage. The writer's observation on the action of dense solutions of sugar is here brought to bear, and the resulting formula is as follows: —

Balsam of tolu	2 dr.
Water of ammonia	20 m.
Granulated sugar	26 oz.
Water	1 pt.

Place the balsam in a porcelain capsule of convenient size, and pour on the water, previously mixed with the ammonia; apply heat for a few moments; and add half the sugar; now continue the heat, without boiling, for half an hour, stirring the mixture frequently, and preserving the measure by the addition of more water, if necessary; then add the remaining sugar, and, after fifteen minutes, remove the heat, and strain the syrup while hot.

UNGUENTUM ZINCI OXIDI.

BY BENJ. LILLARD, PHAR. D.

There is probably no officinal preparation the formula of which has been so much objected to, criticised, commented on, and improved at, as that for making the popular ointment of zinc oxide. The infection seems to have spread to the solemn revisers of the Pharmacopœia, who have added to the variety, in the way of new formulas, at different revisions. In the preparation of any medicine the easiest and simplest process that secures a good, uniform product is always the best. The way in which I have long made this ointment is quite different from that of any of the published formulas I have seen, and is, in my opinion, better, because it secures a good result, in an easy way, and is well adapted to extemporaneous use. It is as follows: —

Oxide of zinc	80 parts.
Lard	400 parts.
Balsam of Peru	30 parts.
Lard oil	q. s.

Rub the oxide of zinc with the lard oil and balsam of Peru, until of the proper consistence; add the lard, and continue rubbing until they are thoroughly mixed. The balsam of Peru, being of similar composition to benzoin, preserves the ointment just as well, and as it is a liquid it can be more easily mixed. It colors the ointment very slightly, and imparts the same delicate fragrance as the benzoin, and by the use of lard oil the question as to which is best — glycerine or sweet oil — is avoided. The lard oil should be added to suit the consistence and quality of the lard and the weather. It makes no color, and possesses none of the objections that have been made to the use of sweet oil and glycerine.

THE TREATMENT OF FEVER.

In an article in the *Dublin Medical Journal*, Dr. Jones reaches the following conclusions: —

1. That in the treatment of fever, typhus and other forms, too much reliance has been placed on *alcoholic* stimulants, and that fashion, rather than reason, has swayed many in their *indiscriminate* employment.

2. That the percentage of cases requiring such stimulants is a low one; and that while our administration of them, as regards quantity and kind, must depend entirely on the condition of the patient, still the utmost caution (with our present knowledge of their physiological action) is required.

3. That in digitalis we have a powerful cardiac stimulant, which, while it gives force to the heart, does not do so at the expense of the system, but rather is a conservative agent, which controls expenditure and limits waste of vital action; always, of course, remembering that a large number of cases will recover without any specific treatment save that care and guidance which provides for the wants of the system and secures the patient from the risks of complications. That digitalis appears to be indicated in the early periods of many cases of typhus in which we have a rapid pulse and high temperature range, regulating our administration by its effects on both, using it rather with the object of guiding the patient up to a certain point than of curing the disease.

MEDICAL MEMORANDA.

Insulation of the Bed in Rheumatism. — Our readers will recollect Dr. Wagenhals's report on this subject, of which an abstract was given in the Journal for May, 1875. Dr. E. Playter, of Toronto, gives a case of the kind in the *Canada Lancet*. The patient was ordered to be insulated, which was done by placing the legs of the bedstead in four glass salt-cellars. The next day he was decidedly easier, and continued to improve rapidly, so that he was entirely free from pain in three or four days more, and able to walk about the house.

The constitutional symptoms in this case were not of a very marked character. The heart's action was labored and irregular in the beginning, but not quickened, tongue slightly coated, white, with considerable thirst, but perspiration not profuse; though these symptoms, excepting the heart's action, were gradually becoming more aggravated up to the time when insulation was tried.

The patient had had two previous attacks, similar, but of much greater duration; from which he had entirely recovered. His father had suffered from two or three very severe attacks of acute rheumatism.

Dr. Playter adds, "One such case does not prove much in favor of insulation, but the improvement in the one above referred to commenced earlier, was more rapid and decided than that of any other case

of like severity which I have treated, in a practice of about fifteen years."

Bromide of Potassium in Migraine. — The London *Medical Times and Gazette* remarks: "One of the essential characters of idiopathic migraine is its tendency to periodicity. This periodicity may be variable, and is often monthly. The migraine is always at first hemicranial, and is then also accompanied by a peculiar sense of heaviness of one of the ocular globes, or over one of the orbits. It is this prodromic sensation that indicates the opportune time for efficacious intervention. Administered then, and in sufficient doses, the bromide of potassium arrests and prevents migraine, while, if the paroxysm is allowed to set in, it will scarcely mitigate the severity of the pain. It is from want of attention to this point that the bromide has caused disappointment. It should be administered in doses of from five to six grammes for an adult male, four for a woman, and from two to three for a child, given in a cup of well-sweetened infusion of lime-tree flowers, aromatized by a drop or two of mint oil. It should be swallowed by successive mouthfuls within a quarter of an hour or twenty minutes."

Solubility of Salicylic Acid in Glycerine. — A German pharmaceutical journal states that one part of salicylic acid dissolves completely in fifty parts of cautiously heated glycerine, the solution remaining clear after cooling. It may be diluted without separating the acid. A solution made with one part of salicylic acid, 20 to 30 parts of glycerine, and 300 to 500 parts of hot water, has been used for some time in the surgical ward of the Bremen hospital.

A Heavy Dose of Mercury. — "A few days ago," says the Gilroy (Cal.) *Advocate*, "Mrs. Anna Babb's little boy drank a pound of quicksilver. The child is less than three years old, and even in California is considered rather young to indulge in so strong a beverage. He found the mercury bottle in some rubbish in an old trunk, while playing, and drank the whole, leaving but a few drops. The physician was sent for, who administered some light remedy. The child gave no other indication of having taken the mercury than drowsiness. The metal did not all leave the stomach for ten days, but he was about all the time, and is now bright as ever."

Chinese Treatment of Small-Pox. — The Shanghai *Gazette* states that shortly before the death of the late Emperor of China, a gigantic image, the goddess of small-pox, was paraded round the city of Pekin in solemn procession, and then taken into the very bedroom of the dying youth, where it was worshipped and honored with many propitiatory offerings. As, however, the goddess continued obdurate, she was subjected to a severe thrashing and other insults, and finally burned. The fatal result of the attack was, we suppose, her revenge for the maltreatment.

The Action of Nicotine. — Smokers will doubtless find some comfort in a paper recently published in England by Dr. Benham. He administered nicotine to man and the lower animals, and found that it killed the latter, not by paralyzing the heart, but by stopping the respiration. Indeed, he says, it quickens and strengthens the heart's action, and recommends its use for that purpose. He found that nicotine contracted the pupils, but its other effects on man were most variable. This seems indirectly to confirm Dr. Krause's opinion, that it is carbonic oxide, and not nicotine, to which the evil effects of smoking are mainly due.

Bromine in Pertussis. — Dr. Vogelsang, of Brel, in Switzerland, finds that one or two scruples of bromine, and as much bromide of potassium, to a tumbler of hot water, placed in the room of a child suffering from whooping-cough, affords it great relief. The mixture should be renewed three or four times a day.

SELECT FORMULÆ.

Iodized Glycerine. — The *Druggists' Circular* publishes a formula for iodized glycerine, received from a correspondent, who is of opinion that it will be generally preferred to the officinal tincture. It has the advantage of not staining the skin, yet is equally efficacious with the unsightly preparations now in use.

Iodide of potassium	1 oz.
Resublimed iodide	1 oz.
Glycerine, to make	16 fluid oz.

Powder the iodide and dissolve in about four ounces of the glycerine; add the iodide and rub well in a mortar until it is dissolved. Lastly, add the remainder of the glycerine.

A Quick Process for Chlorine Water. — We find the following in *New Remedies:* "Many druggists have occasion to find fault with the impracticable, or rather not very ready method of preparing chlorine water to order, by means of peroxide of manganese, salt, and sulphuric acid heated in a retort. I propose the following ready process, by which I am always able to prepare it at five or six minutes' notice. I hope the improvement will be found useful and acceptable to the profession: —

Chloride of sodium	1 drachm.
Sulphuric acid	2 fl. drachms.
Red oxide of lead	6 drachms.
Water	8 ounces.

"Triturate the sodium and lead intimately, place in an eight-ounce vial containing the water, add the acid, cork the bottle, and agitate till the insoluble matter is entirely white."

Milk of Roses. — The following is a good recipe for this popular cosmetic: —

Almonds (blanched)	½lb.
Rose water	1 qt.
Alcohol, 95 per cent.	4 oz.
Oil of rose	1 dr.
White wax, Spermaceti, Oil soap	āā ½oz.

Melt the soap in three ounces of rose water over a water bath, when melted add the wax and spermaceti, and mix well with occasional stirring; make an emulsion of milk with the almonds and rose water, and strain without pressure; place the saponaceous mixture in a mortar and with constant stirring gradually add the almond emulsion, and continue to stir until the whole is completely blended together. Next slowly add the alcohol (in which the oil of rose has been dissolved) and stir vigorously for some time; put the whole in a bottle, let it stand twenty-four hours, then bottle for use, rejecting the sediment.

All the above precautions being taken, the milk of roses will keep a great length of time without any separation or precipitate.

Diarrhœa Mixture. — The following is given in the *Philadelphia Medical Times:* —

Olei ricini	♏ xxiv.
Sp. chloroformi	ʒ iss.
Sol. morphiæ mur.	ʒ j.
Pulv. gum. acaciæ	ʒ iiss.
Syrupi	ʒ ss.
Aquæ	ad ʒ iv. M.

A dessert-spoonful every hour and a half until the bowels are quieted.

Local Anæsthetic. — This is from the same authority: —

Pulv. camphoræ	ʒ iiss.
Ætheris sulph.	ʒ v. M.

Rub into the skin for a few moments at the locality where it is desired to produce anæsthesia.

Camphor Ointment. — The following is commended as useful in erythema and in vesicular and squamous affections of the skin.

Pulv. camphoræ	gr. xv.
Glycerinæ	q. s.
Axungiæ	ʒ j.

FACETIÆ.

Physic and Farces. — Sir John Hill, who was born in 1716 and died in 1775, was originally an apothecary, but afterwards became famous as a physician and an author. His versatility of talent was remarkable, his works including books on medicine, botany, natural philosophy, and natural history, besides dramas, novels, and many lighter compositions. He quarrelled with Garrick, who wrote the following epitaph on him: —

"For Physic and Farces
His equal there scarce is;
His Farces are Physic,
His Physic a Farce is."

Dr. Johnson said of Hill, that "if he would have been contented to tell the world no more than he knew, he might have been a very considerable man," which was a fair hit at his attempts to add by literary quackery to the reputation he might honestly have won.

A Western Recipe. — The *Indiana Journal of Medicine* for July prints the following: —

A RESEAT FORE THE SISTUM

Sasaprile theard of o ʒ
Wahoon theard of o ʒ
Wild Cherrey quartr of o ʒ
One pint of Alkhol
2 pound of Shugr
One pint of wattr.

Conmlit All.

pr dos one swaller 3 times pr dy Before Eating.

The above is an exact copy of a "reseat" given by a travelling doctor who said he resided in Ft. Wayne, to Mr. Peter Kesler, of Milam Township, for which he paid the doctor $2. It will not be healthy for this doctor to meet Mr. Kesler.

CINCHO-QUININE.

The following are extracts from a few out of the many recent testimonials to the therapeutical value of this agent: —

Newton, Mass., *June* 2, 1875.

In medical practice it is frequently found that the *bark* in substance, or its extract, will cure intermittent fevers when pure quinine will not; and it is desirable to obtain a compound salt that is representative of the entire virtue of that drug without its dross. This we can find in Cincho-Quinine. I have employed it in practice for many years.

During the last five years I have had to treat numerous cases of intermittent fever, and in all cases I used this product with success; the doses varying from one to four grains, and never exceeding the latter even in a case which originated in Mexico and was reproduced in New York State. I have found it, alone or combined with ferrous salts, everything which I required, and in a disinterested conviction I would commend it to the profession as a valuable antiperiodic and corroborant medicament.

Wm. F. Teulon, M. D.

Coldbrook, Ohio, *June* 15, 1875.

I have been using your Elixir Peruvian Bark with Protoxide of Iron, and also your Cincho-Quinine, with the most gratifying results. H. J. Shatto, M. D.

New York, *June* 17, 1875.

To the Editor of The Homœopathic Times: —

The Staff of the Western Homœopathic Dispensary would like space in the *Times* to state that the tonic medicines made by Billings, Clapp, & Co. have been thoroughly tried and found exceedingly satisfactory, and we take pleasure in directing the attention of the profession to the same with our recommendation, namely, Cod-Liver Oil, Cincho-Quinine, and Elixir Peruvian Bark with Protoxide of Iron.

Henry, Ill., *July* 19, 1875.

I should like to add my testimony to that of many of your other medical friends in reference to your valuable remedy, Cincho-Quinine. I would say that I have used it with success for about five years, and prefer it to Sulphate of Quinine. In cases of typhoid fevers, particularly, I find that it never produces nausea. It can be given to women and children with no trouble, on account of the absence of that intense bitterness peculiar to the sulphate. I have prescribed as much as two ounces per day during epidemic ague, and freely say that I like it in every particular. J. E. Powell, M. D.,
Late surgeon on British transport ship Mary.

Grand Saline, Texas, *July* 20, 1875.

I have used Cincho-Quinine in several cases of intermittent fevers, and it has given entire satisfaction. I think it is as good as the sulphate if not better. Jas. Mass, M. D.

Boston Journal of Chemistry.

VOLUME X. BOSTON, OCTOBER, 1875. NUMBER 4.

Familiar Science.

SELENIUM AND PHOTOMETRY.

Of the sixty-three or sixty-four elementary substances known to chemists, twenty or more are not only rare but of little or no practical importance. They are more or less interesting from their chemical relations to other elements, but neither they nor their compounds have as yet been found useful in the arts. Among these curiosities of the laboratory or lecture-room selenium is one of the most interesting, though it has hitherto been one of the most useless. It was discovered in 1817 by Berzelius, who named it selenium, from σελήνη (*selene*), the Greek name for the moon, for the somewhat fanciful reason that it is often found associated with tellurium (discovered in 1782 by Müller von Reichenstein, but first carefully studied by Klaproth in 1798), which is named from *tellus*, the Latin for the earth. Both elements are closely allied, in their natural history and their physical and chemical properties, to sulphur.

Selenium is sometimes found in a free state in connection with certain varieties of native sulphur, but oftener in combination with metals as *selenides*, which are associated with the sulphides. The iron pyrites (sulphide of iron) of Fahlun, in Sweden, is especially remarkable for the presence of selenium, and was the source whence it was first obtained. When the pyrites was used for making sulphuric acid, a reddish deposit was found in the leaden chambers in which the acid was collected, and from this Berzelius separated the new element.

Like sulphur, selenium exists in three distinct modifications, or "allotropic states." From its solutions it is obtained as a deep red precipitate. If this is melted and suddenly cooled, it appears as a brilliant black solid like glass, with a specific gravity of 4.3. Medallion portraits of Berzelius were cast in this black, vitreous form of the element, soon after its discovery. If the fused selenium is cooled slowly, it becomes a dark gray, brittle, crystalline substance, with a metallic lustre like that of lead and a specific gravity of 4.81. In its vitreous form it does not conduct electricity, but in this crystalline state it does; the former is soluble in bisulphide of carbon, the latter insoluble.

Selenium is less combustible than sulphur. It burns in the air with a bright blue flame, emitting an odor which has been variously compared to "rotten cabbage" and "putrefying horse-radish." The product of the combustion is selenious acid, of which this odor is characteristic. With hydrogen selenium forms hydric selenide, or selenietted hydrogen, which is chemically analogous to sulphuretted hydrogen, and is even more offensive and poisonous than that ill-smelling compound.

But the heading of this article implies a connection between selenium and photometry, and we will give a brief account of this new and curious application of the element. It is a striking illustration of the unexpected ways in which these hitherto useless substances suddenly prove to be of some scientific or industrial value.

Various photometers, or instruments for measuring the comparative intensity of lights, have been devised, but they are all on essentially the same principle. In Rumford's an opaque rod is put before a ground-glass screen, and the two lights to be compared are so placed that the shadows of the rod thrown by them on the screen shall be equally dark. Their intensities are then as the squares of their distances from the screen. Bunsen's photometer is based on the fact that an oil-spot on white paper ceases to be visible when it is equally illuminated on both sides; and the lights to be tested are placed at such distances from the two sides as to cause the spot to disappear. With both instruments the eye must be used to decide when the effects produced are exactly equal; and in some cases, especially when the lights vary at all in color, this decision is liable to be more or less inaccurate.

The electric photometer just invented by Dr. Werner Siemens is free from this source of error. It depends upon the remarkable property which crystalline selenium has of conducting electricity better in the light than in the dark. Its conductivity increases in exact proportion to the degree of illumination, and the measure of the former is therefore the measure of the latter. The apparatus employed is thus described by the inventor: —

"At the bottom of a small tube, which can be rotated, is some of the crystalline selenium placed between two small, flat spirals of wire. The ends of the two spiral wires are connected with each other through a Daniell cell and the wire of a galvanometer. The needle is thus deflected. If I remove the cover of the tube, and admit the light of a gas-flame, whose strength I would measure, to the selenium disk, the conductivity of the disk increases proportionally to the intensity of the light; so the deflection of the needle becomes greater. If I now turn the tube so that it is directed to a normal candle, instead of to the flame to be measured, and regulate the distance of this normal candle so that the deflection of the needle becomes and remains the same when the selenium is alternately illuminated by the flame to be measured and the normal candle, the light action is the same from both, and the intensities of the lights are accordingly in inverse proportion to their distance from the selenium plate."

The apparatus can be made as sensitive as is desired, and when perfected it is likely to supersede all other forms of photometer. Dr. Siemens, by continued experiments in the fusing and cooling of the vitreous selenium, has succeeded in obtaining a crystallized variety which conducts electricity much better and is much more sensitive to the influence of light than the ordinary crystalline selenium, and which has the additional advantage of not being materially affected by the heat rays. Indeed, its conductivity *decreases* on heating, while the conductivity of the ordinary form *increases* with heat. Its value for strictly photometric purposes is thus greatly increased.

MUSCLE AND GUNPOWDER.

In the JOURNAL for April, 1874, we explained how the amount of work that food is capable of performing is calculated, and how this theoretical amount compares with the work actually done by the human machine. According to the data then assumed, the effective result is about one fifth of what ought to be obtained by the combustion of the food. If this is less than we might have expected, it is better than is found in the case of the steam-engine, the "useful effect" of which is only from three to ten per cent. of what the transformation of the heat of the fuel into work ought to yield.

According to calculations recently made by M. de Saint-Robert, and communicated by him to the *Revue Scientifique*, the work done by gunpowder in modern fire-arms is relatively much greater than the best results obtained with the steam-engine, and nearly equals the average of the human machine.

According to Moleschott's estimate, the combustion of the average daily food of a working-man ought to yield a mechanical equivalent of about 8,880,000 foot-pounds; but the average work that he does is only about 2,000,000 foot-pounds. In other words, the "useful effect" is about 22 per cent. of the total available work. Helmholtz estimates the external work of a man as one fifth of the mechanical power contained in his food.

Fire-arms, like the human body, are machines for converting heat into motion, the heat being obtained by the combustion of gunpowder. The gases evolved in this combustion give motion to the projectile by their expansive force, and at the same time a certain amount of heat disappears, being transformed into work. The total work accomplished by the powder, independent of the recoil, is equal to "the product of the weight of the projectile by the height to which it would rise if projected vertically in a vacuum." The "useful effect" is measured by the ratio between this work and the mechanical equivalent of the heat set free by the combustion of the charge.

If we take for illustration, as M. de Saint-Robert does, a rifled cannon, whose bore has a diameter of 7.5 centimetres (about 3 inches), and which fires a shell weighing 3.7 kilogrammes (about 8.14 pounds) with a charge of .55 of a kilogramme (about 1.21 pounds) of powder, experiment shows that the velocity of the shell when it leaves the gun is about 400 metres, or 1300 feet, per second. The height from which it

would have to fall to acquire this velocity is 8158 metres, or about 26,600 feet; and multiplying this by the weight of the ball, the work actually done by the powder is found to be about 216,500 foot-pounds.

On the other hand, the calculated mechanical equivalent of the heat evolved by the combustion of .55 of a kilogramme of gunpowder is about 1,050 000 foot-pounds. Comparing this possible work with the actual work as just given, we find the useful effect of the cannon to be between 20 and 21 per cent., or a trifle less than the result already found for the human machine.

The comparative cost in money of the work done in the two cases is quite another question. Of course the gunpowder burnt in the cannon is a much cheaper fuel than the food consumed by the man. In this respect the steam-engine, though it utilizes a smaller percentage of the heat from its fuel, has a decided advantage over the human machine. Assuming that the labor of eight men is equivalent to one horse power of the engine, it is evident that the cost of the former will be many times greater than that of the latter.

DARWIN ON INSECTIVOROUS PLANTS.

In a brief article on so-called "carnivorous plants," two months ago, we mentioned that Darwin was said to be preparing a work on the subject. This has since made its appearance under the title of "Insectivorous Plants," and has been reprinted in this country by the Appletons. It seems to us that it proves beyond question that certain plants not only catch insects, but devour and digest them by a process essentially like that seen in animals, and absorb the products of the digestion into their systems.

The author begins his investigations with the round-leaved sundew, or *Drosera rotundifolia*, and to this plant the greater part of the volume is devoted. The structure of the plant is first described, especially the leaves, with their glandular organs and hair-like tentacles; and its movements are then carefully studied. When a gland is excited by the touch of any small particle, especially of meat, it spreads its influence not only to its own tentacle, but also to those of adjoining glands, so that all promptly begin to bend inward toward the centre, thus inclosing the particle of matter which has excited the movement. These movements are especially active and energetic when the irritating matter is nutritive, for otherwise they soon begin to reëxpand and to resume their normal attitude. Momentary pressure does not produce any movement, but the slightest weight, if prolonged, sets the tentacles in action. Mr. Darwin placed a bit of blotting-paper, weighing $\frac{1}{4\,8\,5}$ of a grain, so as to rest on three glands. Each gland, therefore, had only to support $\frac{1}{1\,3\,9\,5}$ of a grain, and yet all the three tentacles slowly curved inward. Again, he took two pieces of a woman's hair, one being $\frac{1}{1\,0\,0\,0}$ of an inch in length, and weighing $\frac{1}{3\,5,7\,1\,4}$ of a grain, and the other, $\frac{1}{1\,0\,0\,0}$ of an inch in length, and weighing a trifle more. These he placed on two glands on opposite sides of the same leaf, and in an hour and ten minutes these two tentacles were inflected half-way toward the centre, while all the other tentacles of the same leaf remained motionless. The smallest particle which he found to have any effect weighed only $\frac{1}{7\,8,7\,4\,0}$ of a grain. It is indeed wonderful that a pressure so infinitesimal should have been able to produce such a result; for in order to induce the movement of the tentacles, the pressure must produce some change in the cells of the glands, exciting them to transmit a motor impulse throughout the whole length of the stalk, which consists of about twenty cells.

But if the sensitiveness of these plants to a touch is remarkable, still more marvellous is their susceptibility to chemical action. A dose of $\frac{1}{1\,3\,4,4\,0\,0}$ of a grain of carbonate of ammonia, given to a single gland, suffices to produce a well-marked effect. A minute drop containing $\frac{1}{1\,5\,3,6\,0\,0}$ of a grain of phosphate of ammonia, if held for a few seconds in contact with the gland, causes it to be inflected; and if a leaf is left immersed for a few hours in a solution so weak that each gland could absorb only $\frac{1}{1\,9,7\,8\,6,0\,0\,0}$ of a grain, even this is enough to excite tentacles to movement. As Mr. Darwin observes, these are perhaps the most remarkable facts recorded in his present work. Although, as he points out, there is nothing incredible in them, since, in fact, every time we perceive an odor much smaller particles act upon our senses; still the sensitiveness of Drosera is the more astonishing as it possesses no nerves nor even any diffused matter analogous to nerve-tissue.

The "specialized nature" of this sensitiveness is very remarkable. On this point the author says: —

"A gland of Drosera may be forcibly hit once, twice, or even thrice, without any effect being produced, whilst the continued pressure of an extremely minute particle excites movement. On the other hand, a particle many times heavier may be gently laid on one of the filaments of Dionæa with no effect; but if touched only once by the slow movement of a delicate hair, the lobes close; and this difference in the nature of the sensitiveness of these two plants stands in manifest adaptation to their manner of capturing insects."

Their indifference to the action of rain and wind is also very curious. Referring to the *Dionæa muscipula*, Darwin says: —

"Drops of water, or a thin broken stream, falling from a height on the filaments, did not cause the blades to close; though these filaments were afterwards proved to be highly sensitive. No doubt, as in the case of Drosera, the plant is indifferent to the heaviest shower of rain. Drops of a solution of half an ounce of sugar to a fluid ounce of water were repeatedly allowed to fall from a height on the filaments, but produced no effect, unless they adhered to them. Again, I blew many times through a fine-pointed tube with my utmost force against the filaments without any effect; such blowing being received with as much indifference as no doubt is a heavy gale of wind. We thus see that the sensitiveness of the filaments is of a specialized nature, being related to a momentary touch rather than to prolonged pressure; and the touch must not be from fluids, such as air or water, but from some solid object."

We have said that these plants digest their food like animals. The similarity between the digestive processes in animals and the manner in which Drosera absorbs nutriment from its victims is most extraordinary. The fluid which exudes from the glands, when closely inflected and holding in their grasp a fly or particle of organic matter, is truly digestive in its character, and consists of an acid and an organic body similar to pepsin. This fluid is so powerful as to dissolve bone, and even tooth-cartilage is treated in the same way. When the glands are bent to the centre, and are concerned in digestion and absorption, no further motion takes place, though they occupy the same attitude for days, and they only begin to relax when digestion is over. In the minute mechanism of this process something very much like reflex action is to be seen; and the whole is so remarkably like nerve-action that the resemblance is quite startling.

We need hardly say that Darwin, in consonance with his well-known theories, believes that insectivorous habits have been gradually developed in these plants. The higher classes of plants habitually derive their nutriment from decaying animal and vegetable matter. Others, like the mistletoe, are nourished by the juices of living plants. The gulf between these and the carnivorous Drosera is to a certain extent bridged by the Utricularia, which does not truly digest but merely absorbs the products of the decay of the animals it captures. We cannot trace the steps by which Darwin supposes that "any ordinary plant having viscid glands, which occasionally caught insects, might be converted under favorable circumstances into a species capable of true digestion," though the space which he takes for the explanation is only a page or two. The book is, indeed, almost exclusively occupied with the statement of facts, and the facts are wonderful enough, however we may attempt to explain them.

A CURIOUS PROBLEM IN MOTION.

Many of our readers have doubtless seen an experiment in which a ball held by a thread between the finger and thumb, which are kept perfectly still, is gradually set in motion, as is claimed, by the *will* of the person holding it. In most cases those who try the experiment do not consciously communicate any motion to the ball, and they honestly believe that it is set swinging by mere volition, or perhaps by some electrical action. The Academy of Sciences at Paris has been lately investigating this and kindred problems, and we find in French journals an abstract of an interesting paper on the subject, addressed to that learned body by M. Chevreul. A celebrated professor of Strasbourg, Dr. Gerboin, has ascribed the oscillations to electricity, and has written a book in which he calls it "a new kind of electrical action." This idea is not a new one, having been advanced more than a century ago. Stephen Gray, F. R. S., who died in 1736, was celebrated in his time for his experiments on conductors of electricity. He passed the last years of his life in studying the ring hanging from a silken thread, under the firm impression that he could thus prove that the force by which the planets are made to revolve round the sun was of an electric nature. In one of his experiments he supposes himself in a position enabling him to see the equatorial zone. An iron ball, about an inch and a half in diameter, and feebly electrified, is placed in the centre of a circular disk of resin about eight inches across; a light body hanging from a fine thread six inches long or thereabouts, held in the hand over the ball, *describes a circular curve from west to east;* if the disk of resin be elliptical, the light body will describe an elliptical curve! Dr. Mortimer, Secretary of the Royal Society, was of Gray's opinion; but Wheeler, who had aided the latter in several of his researches, declared that the desire

of the experimenter to see his theory confirmed was the real cause of those motions. The dispute was continued after Gray's death; Priestley says they could arrive at no conclusion in the Royal Society, but that he thought Wheeler was in the right. M. Chevreul proceeds to say that his own experiments now confirm Wheeler's opinion; and he then lays down this principle: "That there are motions which our muscles impart to bodies without our being conscious of them, provided we think those motions possible; moreover our eyes, *when open*, being disposed to follow them, humor the direction of the motion, which therefore takes place in consequence of our *thought*, which is not our *will*, and of an exterior accidental cause which operates on our sight."

The abstract of M. Chevreul's paper which we have seen was brief and in a popular journal, but his explanation as reported appears to be the correct one. The subject is curious and interesting, and we may refer to it again.

UNDERNEATH THE GREAT EASTERN.

The Great Eastern has been lately in dock at Milford Haven, and an enormous amount of "live stock" has been removed from her bottom, which had not been scraped since 1867. A correspondent of *Land and Water*, who visited the vessel with the view of obtaining specimens for the Brighton aquarium, says: "There were a few barnacles (*Balanus tintinnabulum*, apparently) near the level of the water-line, especially about the stern-post and between it and the rudder, and the latter itself, as well as the propelling screw, was covered with the common acorn-barnacles or 'chitters;' but all the rest of the hull usually submerged was clad with an enormous multitude of mussels, clustered together in one dense and continuous deposit extending over a surface of 52,000 square feet of iron plates, and in some parts six inches thick. Mr. Beckwith had made a calculation, which I was able to verify with him, of the total weight of the mussels thus accumulated. It was found by careful experiment that the average weight of those on each square foot was from 12 lbs. to 13 lbs.; therefore the vessel was encumbered with not less than *three hundred tons* of living marine animals adhering to her — *mussels enough, in fact, to load with full cargoes two ordinary collier brigs!* Although the mere weight of this mass would not, perhaps, much affect the buoyancy of a vessel of 25,000 tons burthen, it will be readily understood that the friction of such a rough, jagged incrustation passing through the water would materially diminish her speed. As these troublesome adherents were scraped off with shovels by workmen employed under contract to remove them, they were carried away by cart-loads and boat-loads, and buried along the shore of the haven. In some localities they would have been heartily welcomed by the fishermen as valuable bait. So completely had the mussels taken possession of every inch of plate-surface, to the exclusion of almost every other living thing, that there was nothing fit for exhibition in an aquarium but some 'plumose anemones' (*Actinoloba dianthus*) of the three varieties, — orange, white, and olive, — fine groups of which had attached themselves in some places to the outer layer of the crowded bivalves."

SCIENTIFIC BREVITIES.

Davy's Definition of Chemistry. — Sir Humphry Davy, in his posthumous work, "Consolations in Travel, or the Last Days of a Philosopher," says: "There is nothing more difficult than a good definition of chemistry, for it is scarcely possible to express in a few words the abstracted view of an infinite variety of facts. I will give you a definition which will have the merit of novelty, and which is probably general in its application: *Chemistry relates to those operations by which the intimate nature of bodies is changed, or by which they acquire new properties.* This definition will apply not only to the effects of mixture, but to the phenomena of electricity; and, in short, to all changes which do not merely depend upon the motion or division of masses of matter."

Enormous Hailstones. — M. Colladon, writing to the Académie des Sciences on the recent dreadful storm that did so much harm at Geneva, Lausanne, and Lucerne, states that the hailstones were of extraordinary dimensions. Most of them measured from ten to twenty millimetres in diameter, many of them being much larger, and some of them reaching sixty millimetres, while one attained a diameter of one decimetre (nearly four inches). At some points it seemed as if artillery were discharging hailstones, some of them weighing not less than 300 grammes (nine ounces troy). Many were hemispherical in shape, having exactly the appearance of lemons that had been cut in half. The discharges of lightning succeeded each other with unexampled rapidity, and at Geneva, from eleven P. M. to midnight, there were counted at least two or three discharges per second, so that in the course of the hour from 8000 to 10,000 must have taken place.

Weight Sustained by Leaves of Victoria Regia. — It is stated in *Science pour Tous* that in the aquarium of the Botanical Garden at Ghent, there is a very large specimen of the Victoria Regia. The head gardener, M. von Hulle, was recently interested in observing the force that was required to immerse the floating leaves in the water. He saw one of them support a child, and another was not even submerged by the weight of one of the gardeners. He was led to experiment as to the limit of this resistance — loading the surface of one of the largest leaves with bricks. It was found to bear a weight of 346 kilogrammes (about 760 lbs. avoirdupois), that is to say, nearly equal to five men of average stature and corpulence.

A writer in a recent English paper tells us that he had the pleasure of being at Chatsworth in November, 1849, when the Victoria Regia there expanded its first giant blossom, on which occasion Annie, the youngest daughter of Sir Joseph Paxton, dressed as a fairy, stood upon one of the immense round leaves. This incident called forth the following lines from the pen of the late Douglas Jerrold: —

"On unbent leaf, in fairy guise
Reflected in the water,
Beloved, admired by hearts and eyes,
Stands Annie, Paxton's daughter.

"Accept a wish, my little maid,
Begotten at the minute,
That scenes so bright may never fade,
You still the fairy in it.

"That all your life, nor care nor grief
May load the winged hours
With weight to bend a lily's leaf,
But all around be flowers."

A New Oxyhydrocarbon Light. — A new invention was lately exhibited at the Franklin Institute, consisting of a small copper vessel, placed immediately over the flame of a jet arranged as in the ordinary oxyhydrogen light, and so connected with a reservoir that the hydrocarbon oil can be fed into it as required. The heat of the flame converts the oil into vapor of high tension, which is carried to a chamber of about one half cubic inch capacity, at the base of the jet, where it mingles with the oxygen and is burned in the ordinary jet, and the flame projected against a piece of lime as in the oxyhydrogen light. In order to start the light it is necessary first to heat the generator with a spirit lamp until vapor is produced, when the oxygen is turned on and the spirit lamp withdrawn. The inventor claims that the light thus produced is more brilliant and cheaper, as well as more convenient where it is difficult to obtain ordinary illuminating gas.

Effects of Electricity on Plants. — The effects of electricity on plants have not been closely studied. It is known to produce contractions in sensitive plants, and to retard the motion of sap. M. Becquerel has studied its influence on germination and development. It decomposes the salts contained in the seed, the acid elements being carried to the positive pole, and the alkaline portions to the negative. Now, the former are hurtful to vegetation, while the latter favor it. M. Becquerel further examined the influence of electricity on the color of plants. The discharge from a powerful machine produced remarkable changes of color on the petals, due, he thinks, to the rupture of cells containing coloring matter.

HINTS FOR EXPERIMENTS.

Collodion Films for Experimental Purposes. — M. Gripon, in the *Journal de Physique*, calls attention to the numerous useful properties of films of collodion in physical operations. There are few bodies that are electrified more easily. The films, stretched on wooden or metallic frames, are thin, transparent, and polished like glass; they polarize light. The thickness (as determined in one case by displacement of interference-fringes) was between .008 and .009 of a millimetre. Collodion gives very beautiful coloration when covering a metal. The membranes are as diathermanous as rock salt for luminous heat of a lamp or a candle; they allow .91 of incident heat to pass; but with obscure heat, as from a blackened cube of water, the diathermanous power is diminished, and they are less diathermanous the less the temperature of the source. Polarizing piles are made by stretching collodion films on zinc frames and piling these up. The heat is thrown on the surface at an angle of 33° 30′. Such piles can be advantageously used instead of the mica piles, in study of radiant heat. Then very delicate vibrating membranes can be made of collodion, and these have various uses in acoustics. The vibrations can be perceived by applying to the vertical membrane a small pendulum consisting of a pith ball suspended by a cocoon fibre.

An Interesting Electrical Experiment. — In a recent number of *Comptes Rendus* M. Lippmann describes the following curious experiment: A rubbed piece of resin is brought near the surface of water in a glass jar, the water communicating with the ground by a platinum wire. Positive electricity comes from the ground and is distributed over the water-surface, and bubbles of oxygen are liberated from the electrode. The hydrogen that was combined with the oxygen remains in excess, and, in some sort, *masked*, so long as the water is electrified. On removing the rod this hydrogen escapes in bubbles. The masked hydrogen is neither combined nor dissolved; one cannot remove any part of it either by diffusion or by oxidation, or by any physical or chemical action which leaves the electric charge intact; yet it is there, for it is liberated when the rod of resin is removed. The words *dissolved* or *combined* may apply to hydrogen held in the interior of a certain mass, but here we seem to have an example of another order of material connection. The masked hydrogen is entirely held at the surface of the water; we might change the entire mass without affecting it.

Hygroscopic Paper. — The *Journal of the Franklin Institute* gives a mode of preparing a useful hygroscopic paper, by Percy Smith. A bibulous paper is impregnated with a concentrated solu-

tion of chloride of cobalt. It is very sensitive to atmospheric variations, being blue in a dry atmosphere, changing to red when the air becomes humid. Four observations a day, made for a year, with every precaution, prove that this paper may be employed to indicate readily and precisely the hygrometric state of the air.

Instantaneous Crystallization. — The following beautiful experiment is described by Peligot in *La Nature:* Dissolve 150 parts by weight of hyposulphite of soda in 15 parts of boiling water, and gently pour it into a tall test-glass so as to half fill it, keeping the solution warm by placing the glass in hot water. Dissolve 100 parts by weight of sodic acetate in 15 parts of hot water, and carefully pour it into the same glass; the latter will form an overlying layer on the surface of the former, and will not mix with it. When cool, there will be two supersaturated solutions. If a crystal of sodic hyposulphite be attached to a thread and carefully passed into the glass, it will traverse the acetate solution without disturbing it, but, on reaching the hyposulphite solution, will cause the latter to crystallize instantaneously in large rhomboidal prisms with oblique terminal faces. When the lower solution is completely crystallized, a crystal of sodic acetate similarly lowered into the upper solution will cause it to crystallize in oblique rhomboidal prisms. The appearance of the two different kinds of crystals will not fail to astonish those not acquainted with this class of experiments.

HOUSEHOLD NOTES.

A Good Family Soup. — According to the London *Agricultural Gazette*, a very good family soup is made from 1½ lbs. of lean beef, 2 lbs. of potatoes sliced thin, 1 large carrot, 1 large onion, a few shalots, 1 turnip, 1 stick of celery, 4 quarts of water. Let it simmer four hours, flavor with hot sauce to suit the taste, salt, pepper, etc. It is a great improvement to fry all the vegetables when cut in small pieces, together with the meat also cut in pieces conveniently small, taking care that there is fat enough added to prevent the raw vegetables from burning. A dessert-spoonful of coarse brown sugar may be thrown into the pan while the meat, vegetables, etc., are frying. After it has simmered four hours, it should be set to cool for the fat to be taken from the top of the soup before being served up for use. The meat should be sent to table in the soup, not strained as is usually done.

Cucumber Catsup. — The following is an English recipe: Gather the cucumbers when full grown, but before they turn yellow; peel and grate them; let the pulp remain upon a cullender until the juice drains off; then rub through a coarse sieve, to separate the seeds; half fill bottles with this pulp, fill up with vinegar, and keep well corked. This retains, in a marked degree, the odor and taste of fresh cucumbers, and is excellent with cold meats. When served at table, salt and pepper are added.

How to Extinguish Lamps with Chimneys. — A correspondent of the *English Mechanic* says: "Turn the flame up to full power, then blow a sharp puff *horizontally* across the top of the funnel, when the light will not only be extinguished, but there will be no after-smoke — the formerly ignited wick will be extinguished by its own carbonic acid gas. On leaving my office at night I thus turn up the flaming wick, and, with a grateful gladness that the desk labors of the day (and night) are over, give a side wave of the hat past the chimney, which draws up the flame from contact with the wick, and the light is gone, and with no after-smell. This cannot be too widely circulated, as I read in the *Times* the other day that a lady lost her life by blowing *down* the chimney, and thus causing an explosion."

Practical Chemistry and the Arts.

SOLDERING WITHOUT SOLDER.

Dr. A. W. Hoffman, the celebrated chemist, has recently suggested that oxyhydrogen blowpipes or other apparatus might be invented whereby the soldering of metals could be accomplished without the use of alloys. He says: —

"It would be useful to turn our attention to the autogenous soldering of metals with the aid of the oxyhydrogen flame, a principle which has achieved such signal triumphs in the treatment of two essentially different metals. Should it not be possible, by the same means, to solder every metal and every alloy with itself, as tin with tin, copper with copper, brass with brass, silver with silver, gold with gold, and even iron with iron, just as we already solder lead with lead and platinum with platinum? The advantages of such a procedure are manifest. Let us try to conceive the neatness of a work-shop in which soldering is performed, not as heretofore, with the soldering iron or at the forge, but with a light, elegant gas-burner. Imagine the artisan no longer annoyed by radiant heat and by the fumes of charcoal, and able to produce in a moment any temperature required, even the very highest, and again to put an end to it by simply turning a cock. Conceive the solidity of the soldering which no longer depends on cementing two pieces of metal with a foreign matter, but on an actual interfusion of two portions of one and the same metal, and which involves the utmost economy of materials and dispenses with all subsequent work, such as trimming the soldered place with a file. Such evident advantages must overcome every prejudice, and prompt us most urgently to commence a thorough experimental investigation of the question."

MEMORANDA IN THE ARTS.

Water Shells. — The artillery experiments at Okehampton, in England, have been successful in proving the great value of the new "water shells." The wooden dummies which represent the enemy, drawn up in loose order one pace apart, in the manner of an advancing army, were struck again and again by the minute fragments of the "water shells" which inflict wounds of a far more dangerous nature than those made by shrapnell or common shell. The "water shell" is not a projectile of special construction, but simply a common shell or cast-iron cylinder filled with water. The shells may be taken on a campaign quite empty, and filled either with gunpowder or with water, according as they are to be employed against earthworks as common shell, or as "water shells" against troops. In the latter case, a small cylinder containing a quarter, or at the most half an ounce of gun-cotton is fitted into the water-filled shell, which is then hermetically sealed. A charge of fulminate powder finds room between the gun-cotton and the fuse, and as soon as the latter is fitted the shell is ready for firing. A common shell filled with gunpowder breaks up into three or four pieces only, while one filled with water and half an ounce of gun-cotton flies into a hundred fragments or more, and the reason is this: the gunpowder explodes comparatively slowly, and breaks up the shell at its weak points, while the gun-cotton detonates with a sudden and terrible force, which, being communicated to a non-compressible body, like water, bursts the shell instantly into minute fragments, the energy being exerted equally on all sides. So rapid and terrible is the force generated by the gun-cotton that the iron shell is sometimes pulverized, the fragments of metal being so minute as scarcely to be visible. The idea of this terrible shell is due to Professor Abel, who brought the subject to the attention of the military authority more than a year ago.

Peanut Oil. — The rapid extension of the cultivation of peanuts in North Carolina, Virginia, Tennessee, Georgia, and South Carolina is due to the use now made of them for the oil they contain. According to official agricultural reports, previous to the year 1860 the whole crop aggregated only 150,000 bushels per annum, grown principally in North Carolina; last season's product reached two million bushels, valued at $3,000,000. In a commercial point of view the oil is much more important than the nuts themselves. This oil is in large demand, and answers for many purposes as a substitute for olive and almond oils; it keeps a long time without becoming rancid. The amount of oil contained in the nut varies according to latitude and other favorable conditions and circumstances, and is proportionately large.

All the oil comes from the "meat," the husk being of no value. The oil is extracted by pressure, and the pressed cake is used both as food for cattle and as manure. Algiers also supplies the port of Marseilles with large quantities of these nuts, from which the oil is expressed, and probably destined to augment the supply of the olive oil for which that city is so great a market. The production of peanut oil in the United States dates back to the war, when it was used to a large extent for table purposes in the South, olive oil being almost unobtainable; it was also used quite generally at that time as a substitute for lard. The cake residuum was made serviceable also; after being roasted and ground it was used in place of coffee and chocolate, making a tolerable if not a desirable beverage.

Japanese Variegated Foil. — We find in foreign journals the description of a process used by the Japanese in the production of a metal leaf used for decorative purposes. Thirty or forty thin plates of gold, silver, copper, and various alloys are laid one over the other in a given order, and soldered together at the edges, so that the whole forms a stout plate of metal. Punches of various shapes, conical, pyramidal, with triangular, square, or pentagonal sides, are now used to make a pattern of perforated figures, which exhibit on their inner sides concentric circles, triangles, and other forms corresponding to the punches used. The plate so prepared is hammered and rolled until it has become quite thin, the holes disappear, and the figures have spread out, preserving, however, their parallelism. A number of broken, straight, and curved lines are thus produced, which, as in a Damascus blade, are free of each other, though consistent in themselves in the same metal, their effect being further enriched by the use of acids to modify the colors. It will be easily understood that thin plates prepared in this way, having an extremely flexible nature, admitting relief, with stamped or engraved designs, and capable of receiving the most various colors and forms, will have many uses in decorative art.

Purification of Smoke. — An apparatus for washing smoke, and so depriving it of its character of a nuisance, is in operation at a factory at Ménilmontant, Paris. A fine shower of water, travelling in the direction of the smoke, and at five times its velocity, is projected into the chimney, where it mixes with the smoke, taking up the soluble gases and precipitating the impurities carried up with the smoke by the draught. The foul water is discharged into a cistern, where it is collected, and a fine black paint is got from it.

A Big Water-Wheel. — Probably the largest water-wheel in the world is that at Laxey, Isle of Man, a locality famous for centuries for its silver, lead, and copper mines. The deepest workings lie some 450 yards below the surface, and are kept dry by the wheel referred to. The wheel, built by a

resident engineer, is called the Lady Isabelle, and has been in operation since the 27th of September, 1854. The duty of the wheel is about 200 horse-power, and it can discharge 250 gallons of water per minute from a depth of 400 yards. The diameter of the wheel is 72 feet, its width 6 feet. A second enormous water-wheel is in this country, and serves to run the Burden iron works at Troy, New York. It is an overshot wheel, of 50 feet diameter and 22 feet width.

Compressed Oxygen for Preserving Meat. — In a recent number of *Comptes Rendus* M. Paul Bert states that a piece of meat placed in oxygen, with a pressure of twenty-three atmospheres, remained from July 29 to August 3 without putrescence or evil odor. It consumed in that time 380 cubic centimetres of the gas. A similar piece suspended in a bell-glass full of air at the ordinary pressure acquired a bad smell, consumed all the oxygen, amounting to 1185 centimetres, and was covered with mould. Another trial was made with oxygen at a pressure of forty-four atmospheres; no oxygen was absorbed between December 19 and January 8, and no bad odor was exhaled. M Bert could eat cutlets preserved in this way for a month, and found them only a little stale in flavor.

The Restoration of Strasbourg Cathedral. — A letter from Strasbourg to the *Industriel Alsacien*, of Mulhausen, says: "The repairing of the damages caused by the bombardment to the cathedral has been going on for three years, and is yet far from completion. The injury done is incalculable, the fragments of the bombs having penetrated to every part of the building. The restoration of the walls of the nave and the replacing of the whole roof occupied two years, and the last year has been spent in repairing the tower and the spire, the straightening of the upper part of which, from a height of 320 feet upwards, is one of the boldest architectural feats of our day. The architect estimates that more than a year will yet be required to restore the magnificent structure to its former perfection."

PRACTICAL RECIPES.

Vienna Yeast. — The Vienna bread is reputed to be the best in the world. It is said to owe its superiority to the peculiar yeast employed, which is also used in the manufacture of the celebrated Vienna beer. This Viennese yeast, according to the London *Chemist and Druggist*, is prepared in the following way: Three kinds of grain, namely, Indian corn, barley, and rye (all sprouting), are powdered and mixed, and then macerated in water at a temperature of 65° to 75° C. In a few hours saccharification occurs. The liquor is then racked off and allowed to clear, and alcoholic fermentation is set up by the help of a minute quantity of yeast. As fermentation progresses the globules of yeast reproduce themselves by a species of budding, engendering at first very small globules, but these rapidly increase in size. Carbonic acid is disengaged during the process with so much rapidity that globules of yeast are thrown up by the gas, and remain floating on the surface, where they form a thick scum. This scum is carefully removed, and constitutes the best and purest yeast. When drained and compressed by a hydraulic press, it can be kept from eight to fifteen days, according to the season.

Marking Tools. — Much trouble can often be saved by marking tools with their owners' names, which can easily be done in the following manner: Coat the tools with a thin layer of wax or hard tallow, by first warming the steel and rubbing on the wax warm until it flows, and let it cool. When hard, mark the name through the wax with a graver, and apply nitric acid; after a few moments wash off the acid, and wipe with a soft rag, when the letters will be etched into the steel.

Simple Test for Lubricating Oils. — A simple method of testing for hydrocarbon or mineral oils in lubricators is to fill a bottle with the oil in question, moistening the cork and inside of the neck of the bottle, and then twisting the cork about its longer axis. The best lubricating oils produce no sound, but the more the oil is adulterated with hydrocarbons and products of dry distillation, the louder the noise produced. An oil that makes a loud noise is most unfitted for a lubricator.

Black Stencil Ink. — Take of shellac two parts, borax one part, soft water ten parts, gum arabic one part, lampblack sufficient quantity, indigo sufficient quantity. Boil the shellac and the borax in the water until they are dissolved; add the gum arabic, and withdraw the mixture from the fire. When cold add lampblack to bring it to a suitable color and consistence, and lastly a very small quantity of finely-powdered indigo. Keep in glass or earthenware vessels.

Gall Soap. — This soap, excellent for washing silks or ribbons, may be made by heating one pound of cocoanut oil to 60° F. and gradually stirring into it half a pound of caustic soda. To this half a pound of Venice turpentine, previously warmed in another vessel, is added. The kettle is allowed to stand for four hours, subject to a gentle heat, which is afterwards increased until the contents are perfectly clear. One pound of ox-gall, followed by two pounds of Castile soap, is then mixed in, and the whole allowed to cool, when it may be cut into cakes.

Pocket Mucilage. — Boil one pound of the best white glue and strain very clear; boil also four ounces of isinglass, and mix the two together; place them on a water-bath with half a pound of white sugar, and evaporate till the liquid is quite thick, when it is to be poured into moulds, cut, and dried to carry in the pocket. This mucilage immediately dissolves in water, and fastens paper very firmly.

Agriculture.

SUMMER VISITORS TO THE COUNTRY.

The summer visitors to the country have nearly all returned to their homes, and a quietness almost painful by contrast exists in many a hotel, boarding-house, and farm-house among the green hills of the Northern States. Those who own country estates, and resort to them early to enjoy pure air and healthful recreation, are preparing to return to city life with its disagreeable odors and jostling crowds. It has been charged that the pleasures of country life have been greatly exaggerated by writers, and that while agreeable experiences have been unduly extolled, the unpleasant ones have been kept out of view. This may be true to a considerable extent, or at least it is certain that the dark side of the picture is seldom turned towards the reading public. It is impossible in this world to find a paradise where all is joy and sunshine. Great calamities, as well as petty annoyances and vexatious cares, will follow us wherever we go, and when overjoyed with the beautiful scenes and experiences which the country affords, not unfrequently will some cloud arise to darken the landscape.

Interferences with perfect human enjoyment are undoubtedly wise provisions in the arrangement of things. Much of our enjoyment comes from contrast, and if we had no ills or disagreeable experiences to escape from, our delights would be less intense, and life be rendered dreary and monotonous. Interruptions to a life of perfect enjoyment, whether they come in the form of impaired health, pecuniary losses, the removal of friends, or the less serious troubles which pass under the general name of "petty annoyances." are all designed for good ends, and we cannot escape from them, whatever be our position or wherever we may reside. It may be well to remember that no individual, man or woman, can run away from himself or herself. Fleeing from the country to the city, or from the city to the country, takes no one away from himself, and if there are the elements of unhappiness within us which arise from wrong-doing, or from perverted or morbid sensibilities, the singing of birds, the babbling of brooks, the brightest sunshine, are all incompetent to separate us from the evil companionship. To enjoy the country we must be in harmony with our better natures, and possess a conscience void of offence. We must not be vexed by rainy days or mists or frosts, for come they will; instead of causes of discontent and unhappiness we should strive to make them sources of real happiness. The poet has sung, "What lady loves a rainy day?" We happen to know a great many ladies who *do love* a rainy day, even while in the country, where picnics, and boating excursions, and pleasant rides and walks are spoiled by the wet. Sweet rest, in-door social converse, opportunity of reading some neglected book or magazine, — these delightful experiences all come of rainy days, and there are many more we might mention. Life in the country has many advantages over that in the city, and the summer now gone by has afforded to many a precious opportunity to recuperate wasted energies, to drive away morbid conditions, to form new friendships, to improve the understanding, and to purify the soul. Let not the good influences be lost by a winter of lassitude and dissipation in the city.

SELLING MILK.

Few farmers seem to realize the fact that constantly feeding milch cows on a farm will impoverish the soil. Almost any intelligent man will admit at once that if he raises 25 bushels of wheat to the acre, he must return some fertilizer to the soil which will replace the elements that the wheat has removed. If we make a chemical examination of the ash of the grain of wheat, we find it to be composed of the following ingredients in the given proportions: —

	In 100 parts
Potash	31.1
Soda	3.5
Magnesia	12 2
Lime	3.1
Phosphoric acid	46.2
Sulphuric acid	2.4
Silica	1.7
	100.0

Wheat contains about 2.07 per cent. of ash of the above composition. The 25 bushels will weigh 1500 lbs., and will contain 31.05 lbs. of ash.

According to a recent report of the Connecticut State Board of Agriculture, the average amount of milk yielded per cow by a number of dairies was 2500 quarts. This is equal to 5312.5 pounds, at 2⅛ pounds to the quart. Now, good milk yields on an average .65 per cent. of ash; or the 2500 quarts will give 34.53 pounds of ash, of the following composition: —

	In 100 parts.
Potassic chloride	14.18
Sodic chloride	4.74
Soda	6.96
Potash	23.46
Phosphoric acid	28.40
Lime	17.34
Magnesia	2.20
Sulphuric acid	trace
Silica	trace

Thus we see that the ash from the 2500 quarts of milk is about the same in amount as from the acre of wheat, and that it does not differ greatly in composition.

Nitrogen is another element that the wheat and cow both remove from the land. Wheat contains 13 per cent. of albuminoids, which will yield 2 per cent. of nitrogen. The 25 bushels will therefore remove 30 lbs. of nitrogen. Milk contains on an average 4 per cent. of nitrogenized bodies, which will yield .614 per cent. of nitrogen; or the 2500 quarts will give 32.42 lbs. of nitrogen. It is not quite so easy to make the comparison of the amount of carbon removed; nor does it make so much difference, as the carbon is derived mainly from the atmosphere, in the one case by the wheat plant directly, in the other by the grass which is eaten by the cow.

From the above it is easy to see why old pastures run down; and the remedy is exactly the same as should be used if wheat had exhausted the soil: that is, the ground must be manured. And the composition of the ash of the milk shows why potash salts and superphosphates produce such remarkable effects on old, worn-out pastures. These furnish exactly the elements that have become exhausted. Farmers who buy grain largely for feeding, and apply the manure produced to the land, are thus almost unconsciously returning to the land that which they have removed in the form of milk. S.

THE VALUE OF COMMERCIAL FERTILIZERS.

The State of Georgia seems to have taken hold of this subject in earnest, and as the result we have before us the analysis of 112 different brands of fertilizers. While the great majority of these rank fairly, some are of very little value, and others are exceedingly good and well worth the price asked for them. On the whole the list shows that, as a class, artificial fertilizers are improving in value. The saving of slaughter-house refuse to a much greater extent than formerly has reduced the price of potential ammonia, and the manufacturers can afford to use a much larger amount of ammonia-producing material, while the South Carolina phosphate beds have had the same effects upon the price of phosphoric acid. If we consider soluble as worth three times as much, and reverted as worth twice as much, as insoluble phosphoric acid, we can readily find what these articles cost per pound, knowing the analyses of the fertilizer and its price per ton. Bradley's acid phosphate contains, according to the analysis of Mr. Means, of Savannah, 6.85 per cent. of soluble phosphoric acid, 5.01 of reverted acid, and 2.13 of insoluble acid. Multiplying the per cent. of soluble acid by three, the per cent. of reverted acid by two, and adding to these products the amount of insoluble acid, we find that the whole amount of acid is equivalent to 32.7 per cent. of insoluble acid. This phosphate is sold at $33 per ton at Savannah. The cost of insoluble acid will therefore be a trifle over $1.00 per unit, reverted $2.00 per unit, and soluble $3.00 per unit. Taking another case of an English superphosphate selling at $50 per ton, and yielding 10.03 soluble, 2.13 reverted, and 1.58 insoluble phosphoric acid, it will be equivalent to 35.93 per cent. of insoluble acid, or the insoluble acid will cost $1.392 per unit, the reverted $2.782, and the soluble $4.174 per unit.

Considering for purposes of comparison that nitrogen is worth twice as much as soluble phosphoric acid, and taking the Cumberland phosphate as example, which contains —

Soluble phosphoric acid	6.76
Reverted	3.75
Insoluble	4.35
Nitrogen	2.48

we find the equivalent for the above in insoluble phosphoric acid to be 47 per cent. Dividing the price, $50 per ton, by this, we find the cost per unit of insoluble phosphoric acid to be $1.064, or 5.32 cents per pound. The soluble acid will cost $3.192 per unit, and the nitrogen $6.394 per unit.

According to Professor Storer, it costs from $2.90 to $3.15 per unit of soluble phosphoric acid to land German phosphates on the wharf in Boston. So that our own manufacturers are now rivalling the foreign product, as will be seen from the above. Another instance is furnished by Upton's superphosphate. According to Goessman's analysis, it contained last year of soluble phosphoric acid 11.32 per cent.; reverted, 4.92; insoluble, 2.11; nitrogen, 1.81. Price, $50 per ton. We find the equivalent in insoluble phosphoric acid for these to be 56.75 per cent.; or one unit of insoluble phosphoric acid would cost $0.88; of reverted, $1.76; of soluble, $2.64; and of nitrogen, $5.28.

In some of the poorer fertilizers the insoluble phosphoric acid costs as much as $2.00 per unit, thus bringing up the price of nitrogen to $12.00 per unit. The unit spoken of above is one per cent. of a ton, or 20 pounds. S.

INSECT DESTROYERS.

A correspondent of the *Scientific American* cares no more for vermin than, according to the old showman, Daniel cared for the lions. "I have not seen a bedbug or a flea in my house," he writes, "for many years. If an army of them were to be brought in, mercury would speedily exterminate them, but I think cleanliness the best and perhaps the only preventive. The common house-fly I do not molest, believing that it more than compensates for its trouble by clearing the atmosphere of effluvia and the animalcules which always arise from the putrefaction of decaying substances during warm weather. So, also, with the birds, which are quite numerous here during the summer; instead of shooting them, or setting up scarecrows to frighten them away, I throw out every possible inducement for them to build their nests in my fruit-trees. The birds capture a large share of the insects in the larval state, and thus the millers are prevented from depositing eggs for a future crop of worms. As to the loss of fruit by the birds, the latter are always sure to be on hand in force in the season of ripe fruit, whether they come early enough to take the worms or not. For the residue of insects which infest my vegetable garden, I find that the laboratory of the chemist furnishes materials fatal to them all, among which white hellebore and cayenne pepper are of the most utility; the bug or worm which cannot find vegetation unflavored with these articles will seek its breakfast elsewhere, and leave my garden unmolested. A few drops of carbolic acid in a pint of water will clean house plants from lice in a very short time. If mosquitoes or other bloodsuckers infest our sleeping rooms at night, we uncork a bottle of the oil of pennyroyal, and these insects leave in great haste, nor will they return so long as the air in the room is loaded with the fumes of that aromatic herb. If rats enter the cellar, a little powdered potash, thrown into their holes or mixed with meal and scattered in their runways, never fails to drive them away. Cayenne pepper will keep the buttery and storeroom free from ants and cockroaches. If a mouse makes an entrance into any part of your dwelling, saturate a rag with cayenne in solution and stuff it into the hole, which can then be repaired with either wood or mortar. No rat or mouse will eat that rag for the purpose of opening communications with a depôt of supplies."

SEEDS AND CUTTINGS.

Iron in Agriculture. — Mr. Mechi has recently spoken in high terms of the superiority of iron gates, iron sheep hurdles, etc., over similar articles in wood, which he evidently considers antiquated and behind the age. Economically, the change, by the alderman's showing, would be greatly for the better. His iron field gates, wire fences, and sheep hurdles are, after thirty years' exposure to the elements, as good as ever they were; and when he compares them with the rotten gate-posts and other wooden articles of equal age, his only wonder is that "agriculture still runs in the same narrow rut." Drinking-troughs for animals he thinks incomparably better made in iron than in wood. They not only, he says, keep cleaner, but last much longer. This latter point is very important, and the experience of thirty years seems a pretty sufficient test; and Mr. Mechi thinks that, even upon that consideration alone, the agricultural community should "pass more rapidly from the old wooden age to that of iron, coal, and brick, with steam as a motive power."

Protection Against Untimely Frosts. — A correspondent of the *Agricultural Gazette*, of London, gives his experience with regard to the frosty nights that sometimes occur late in the spring or early in the autumn. He says that when he suspects that there is or has been a frost on his vegetables, he at once goes out into his garden, gets his watering-pot, and sprinkles with water those tender plants which are liable to be frost-bitten — taking care to do this before the sun rises. By this means he has never failed to obviate the disastrous effects of frost, when his immediate neighbors have suffered severely from them. The remedy is simple, inexpensive, not very laborious, and well worth trying.

Propagating Carnations, etc. — The London *Garden* says that in a nursery at Clapton, where thousands of these plants are annually struck from pipings, it is an established rule never to prepare the cuttings or pipings, as they are termed, with a knife. The plan adopted, according to Mr. Casey, is to take hold of the top of the "grass" and draw it gently until it breaks, which it will do at one of the joints; cuttings thus treated are found to root much better than those made with a knife, which, unless very sharp and skilfully used, bruises the tissues and predisposes the cuttings to damp off. This mode of preparing cuttings is worth a trial, not only in the case of carnations, but also in that of other plants which have distinctly articulated or jointed habits of growth.

About Bananas. — Few people who see bananas hanging in fruit-stores think of them as more than a tropical luxury. In fact, they are a staple article of food in some parts of the world, and, ac-

cording to Humboldt, an acre of bananas will produce as much food for man as 25 acres of wheat. It is the ease with which bananas are grown that is the great obstacle to civilization in some tropical countries. It is so easy to get a living without work that no effort will ever be made, and the men become lazy and intolerably shiftless. All that is needed is to stick a cutting into the ground. It will ripen its fruit in twelve to thirteen months, without further care, each plant having 75 to 125 bananas, and when that dies down after fruiting, new shoots spring up to take its place. In regions where no frost ever reaches, bananas are found in all stages of growth, ripening their fruit every month and every day in the year. Colonel Whitner, near Silver Lake, Florida, has probably the largest banana plantation in the United States, containing fully 10,000 plants in bearing. Some of these are large trees, which do not die after bearing their fruit, but the majority are of the dwarf species, which are renewed every year. Slips are planted about 8 feet apart, and rapidly push up leaves disclosing six or eight small bananas behind this protection. Some plants will have sixteen or twenty leaves and bunches of fruit, bending over as it ripens, forming a most beautiful sight.

A Brief Lecture with a "Turnipy" Text. — An English journal would have the young folks consider the turnips how they grow, and reads them the following little homily on that theme: "The greater number of plants feed and grow at the same time; but there are some of them which like to feed first and grow afterwards. For the first year, or, at all events, the first period of their life, they gather material for their future life out of the ground and out of the air, and lay it up in a storehouse as bees make combs. Of these stores — for the most part rounded masses tapering downwards into the ground — some are as good for human beings as honeycombs are; only not so sweet. We steal them from the plants, as we do from the bees, and these conical upside-down hives or treasuries of Atreus, under the names of carrots, turnips, and radishes, have had important influence on human fortunes. If we do not steal the store, next year the plant lives upon it, raises its stem, flowers and seeds out of that abundance, and having fulfilled its destiny, and provided for its successor, passes away, root and branch together. There is a pretty example of patience for us in this; and it would be well for young people to set themselves to grow in a carroty or turnipy manner, and lay up secret store, not caring to exhibit it until the time comes for fruitful display. But they must not in after-life imitate the spendthrift vegetable, and blossom only in the strength of what they learned long ago; else they soon come to contemptible end. Wise people live like laurels and cedars, and go on mining in the earth, while they adorn and embalm the air."

M. Thiers in his Garden. — A French journal says that M. Thiers is an enthusiastic horticulturist. He knows each flower in his garden, and treats it as a personal friend. The little semicircular pleasure-ground at the back of his mansion in Paris is tended by two gardeners. The master's ideal is so high that they scarcely suffice for the work. There is no fresher or more delicious spot in Paris than this oasis. Birds are encouraged to settle in it. The Commune did not destroy the old trees. But a fine poplar and mountain ash were killed by the demolition dust.

Tomatoes versus Insects. — A correspondent of the *Rural New-Yorker* says: "Set a tomato plant into each hill of cucumbers, melons, and squashes, and you will have no trouble from the striped bugs that are so destructive to these plants. The plants can be tied to stakes, and if well pruned when large, both subjects can proceed with their fruiting without detriment to one another."

Boston Journal of Chemistry.

Jas. R. Nichols, M. D., *Editor.*
Wm. J. Rolfe, A. M., *Associate Editor.*

BOSTON, OCTOBER 1, 1875.

KEROSENE.

Having been brought by experience directly into contact with the so-called kerosene oil, during the present season, we have given to it some attention. At our residence in the city, street gas has been used for household illumination; and for lights to be carried from room to room paraffine candles have been preferred to any other form of portable lights. At Winnekeni Hall, our new summer residence, no supplies of street gas could be reached; consequently other methods were considered for obtaining light. The house was piped and made ready for gas, with the view of manufacturing it upon the premises; but at the commencement of housekeeping in the early summer, a great press of cares came upon us, and as a temporary matter kerosene oil and lamps were introduced, and so satisfactory was the experiment that it has been prolonged to the present time.

The history and chemical nature of kerosene have been perfectly familiar to us from the period when petroleum was first discovered, but to the improvements which have been recently made in the manufacture of the liquid, and in the construction of lamps, we had given but little attention. The article as now made by our best refiners is very nearly perfect; that is, nearly or quite all the objections to its use have been removed. It is cleanly, quite inodorous, of a density which insures safety, and the light afforded is white and clear, and even preferable to that from the best gas. It affords more and better light for the cost than any other substance known; and we are certain that no liquid or solid will *ever be known* which will excel it in these particulars. The cost of the light from kerosene, compared with that of gas at ordinary city prices, is surprisingly low. In examining bills for light, as presented in the seasons of 1874 and 1875 (in the former year gas being used, in the latter kerosene), we find the difference immensely in favor of kerosene. The large stone mansion at the farm, with eighteen rooms, has been lighted the present summer at an expense of less than one dollar a month. The liquid has been used freely and constantly, and in no way has any special inconvenience been experienced, or any want of more light felt. When burning gas in the city, during corresponding months in 1874, the cost averaged over ten dollars a month. On the score of cheapness, therefore, the account stands in favor of kerosene, as one to ten. The kerosene used was manufactured by Messrs. Downer & Co., of this city. As regards safety, with this article, we have not felt the slightest solicitude. From careful experiments we learn that it will not form vapor, or ignite, at temperatures much higher than that of the hottest summer months. It is therefore as safe as any illuminating agent can be. No doubt other manufacturers make as good and safe oil as the house to which we have alluded.

The improvements in lamps for burning kerosene have been even more surprising than those connected with the liquid. A vast amount of ingenuity has been expended in the construction of devices for securing perfect combustion, and for rendering the lamps convenient. A device which is new to us affords perfect means of using a round wick, thus placing upon our tables a lamp equal in every respect to the celebrated Carcel. We are writing these lines by the light of a lamp of this nature, which cost only sixty cents; a Carcel burner costs perhaps twenty dollars, and the expense of supplying it with sperm oil would be at least ten times greater than the cost of kerosene.

We are deeply impressed with the immense advances made in obtaining artificial illumination during the past twenty years. Chemistry has done great service to millions of households in this one direction. Petroleum is a crude product, which in itself cannot be used for lighting purposes. It must pass through the hands of the chemist before it is fitted for domestic uses. It is a great blessing to live in this nineteenth century, when few are so poor as not to be able, if in health, to procure good food, and an evening light far better than was found in palaces one hundred years ago.

ADULTERATION AND THE FINE ARTS.

Adulteration has been mainly considered with reference to the health of the human race and to the operations of the industrial arts; but it has an important bearing upon the durability of works belonging to the department of the fine arts. Mr. Holman Hunt, in England, has been laboring for some time to impress this fact upon the lovers of art. A great painting depends for its immortality not merely upon the genius of the artist, but upon the honesty of the manufacturer who furnishes the pigments employed in producing it. Many of the works of the old masters are as effective now as when they were executed, having gained from the mellowing influences of time what they may have lost in freshness of coloring. It is very different with many modern paintings, which already are seriously deteriorating, from the changes which are taking place in the colors. The early painters made their own pigments, and were very careful as to their purity, as well as that of the oils in which they were mixed and the varnishes with which they were protected. At the present day the painter generally buys his materials ready made, and runs the risk of being cheated with adulterated products. Mr. Hunt shows that not only are pure poppy and linseed oils — the kinds chiefly used — almost impossible to be obtained, but the seeds themselves are largely adulterated before reaching this country. Indeed, there is scarcely a business in which adulteration exists to such a degree as in the oil-producing seed trade, which is carried on by a strongly organized body of traders, against whom the agriculturists, who employ the refuse very largely for cattle-feeding purposes, have long contended with small success. As regards pigments, Mr. Hunt mentions, as an example, a specimen of high-priced vermilion, procured from an eminent dealer in artists' colors, which, when analyzed, was found to be adulterated, to the extent of more than 12 per cent., with red lead.

It is bad enough that we should be swindled by the adulterations in almost every article used in our household economy, and in the arts that

have relation to our every-day life; but it is infinitely worse that a thing of beauty like a noble painting, which ought to be "a joy forever," should become, through the villainy of a tradesman, as frail and perishable as a shoddy garment. Shall the perpetuity of the grandest achievements of pictorial art lie at the mercy of a dishonest paint-maker?

AMERICAN PHARMACEUTICAL ASSOCIATION.

TWENTY-THIRD ANNUAL MEETING.

This association met in Boston on the 7th of September, at Odd Fellows' Hall. The attendance was larger than at any previous meeting, and more new members were received, 139 names being added to the roll. The first day was mainly occupied in the business of organization. The president, Mr. C. L. Diehl, read his annual address, paying especial attention to jaborandi, the new drug that has been attracting so much attention during the past year. The various experiments that have been made of late years to determine the active principles of digitalis were mentioned, and full description was given of salicylic acid and the methods of preparing it. In the evening a reception was held at the St. James Hotel.

The first business on the second day was the annual election of officers. Prof. G. F. H. Markoe, of Boston, was elected president for the ensuing year. The reports of the secretary, executive committee, and treasurer were then read. These show that the association is in a flourishing condition, having a balance of upwards of a thousand dollars in the treasury.

A very interesting report upon the sophistication of drugs, chemicals, and kindred articles was read by the chairman of the committee, Dr. A. W. Miller, of Philadelphia. He spoke of the great difficulty of obtaining authentic specimens of adulterated articles. Although notices had been inserted in all the leading pharmaceutical journals, only eight specimens had been forwarded to the committee. They had, however, collected a great amount of information upon the subject from various sources. Particular attention was called to the wholesale adulteration of essential oils, a pure article being the exception. Oil of turpentine is the favorite adulteration, in some cases merely enough of the essential oil being added to give it the desired flavor. French oil of almonds is frequently made from peach kernels. Wax is largely adulterated with paraffine. The worst specimen of wax reported on was composed mainly of some earthy substance, which had been made to assume the proper appearance by dipping into melted wax. Castor-oil was found to be adulterated with lard and croton oils.

At one o'clock the convention adjourned to pay their respects to an excellent dinner that had been provided for the members by the local committee. After dinner the time until three was occupied in making an examination of the splendid collection of pharmaceutical articles that were displayed in an adjoining hall. This was the most interesting and instructive feature of the meeting. The huge specimens of the alkaloidal principles of bark and opium, together with the extensive and beautiful samples of other chemical agents as shown by Messrs. Powets & Weightman, of Philadelphia, attracted universal attention. Messrs. Rosengarten & Sons also made a fine display, as did many manufacturers in this and other cities. Altogether, we doubt if a more extensive or attractive exhibition of articles used by chemists and pharmacists was ever made in this or any other country, and this view is sustained by the testimony of a distinguished London physician, Dr. Robert Ellis, who was the guest of Dr. Nichols at the time. Dr. Ellis is confident that it was a more remarkable display than any ever made in Europe. We cannot help feeling a just pride in this feature of the meeting, and are certain that an exhibition of fine chemical products will be made at Philadelphia next year which will astonish European chemists and manufacturers. In the evening the visiting members were entertained with a concert and supper.

Thursday morning the convention met at nine to listen to the answers of various queries that had been proposed at the last annual meeting. Some of these answers were quite elaborate and valuable essays, but the present crowded condition of our columns will not admit of an extended notice. Dinner was again served in the hall, and the afternoon was devoted to further consideration of the queries.

On Friday morning the queries were resumed and several volunteer papers were read. At noon the convention adjourned to the steamboat Governor Andrew, for an excursion down the harbor and a clam-bake at Downer Landing. Before adjournment it was voted to meet in Philadelphia on the second Tuesday in September, 1876.

The gentlemen from abroad were delighted with the attentions bestowed upon them by the Boston druggists, and certainly nothing was left undone that could be done to render the visit agreeable. Boston hospitality and kindness were never more fully shown, and we think the members will not soon forget this meeting of the association. On the whole the meeting was one of the most pleasant we have ever attended. Such gatherings cannot fail to advance the science of pharmacy. S.

EDITORIAL NOTES.

Deep-Sea Soundings. — A few years ago it was considered a feat in deep-sea sounding to reach a mile or a mile and a half, and even then, after allowance had been made for the action of currents upon the line, the actual depth attained was a good deal matter of calculation or guess. Breakages also were continually occurring in the hauling up, from the necessary slenderness of the cord in comparison with the weight of the lead. The modern method by which the lead detaches itself at the bottom meets that as well as several other difficulties nearly as important, and the wonder is that it was not thought of sooner. Now there is scarcely any limit to the depth of soundings, except the depth of the sea, which the recent explorations of the Challenger go far to show to be in accordance with the theory that its greatest depth is equivalent to the height of the highest elevations above its level. The deepest sea soundings yet effected by the Challenger were obtained this year in the abysses off New Guinea, depths which have occasioned a sharp line of demarcation between the fauna of Asia and Australasia. The "lead" weighed 4 cwt., and struck bottom at the tremendous depth of 4575 fathoms, or 27,450 feet. A second sounding made soon after gave 4475 fathoms. Three out of four thermometers that had been sent down were crushed by the enormous pressure of the superincumbent water, amounting to between 5 and 6 tons to the square inch. The surviving thermometer showed the temperature at that depth to be 34.5° F.

These are the deepest trustworthy soundings on record with the exception of two taken by the Tuscarora off the east coast of Japan, which were respectively 4643 and 4655 fathoms.

Whole Wheat Flour. — The whole wheat flour made at Chicago by the Cold Air Attrition Mills, is highly spoken of by those who have used the article. We shall give it full examination and trial, and place before our readers the results at an early day. A letter from Dr. Cutter concerning it may be seen in our advertising columns.

Pure Gutta Percha and Submarine Telegraphs. — It may not be generally known to our readers that the failure of the first Atlantic cable was mainly due to the impure material of the insulating coating. Until 1861 no thorough and economical method had been devised for purifying the gutta percha used for this purpose. In that year Mr. Edwin Truman, of London, perfected a process for cleansing gutta percha by kneading it by machinery in water of a proper temperature. All the impurities are thus eliminated, even to the finest particles of impalpable powder. The process was patented in 1861, and became the property of a company. The inventor appears to have received little in a pecuniary way from his invention, and even less in the way of honor. It is only within a few months that his name has become known to the public in connection with the invention. Meanwhile more than 20,000 miles of cable have been coated with material prepared under this patent, and the profits of the company controlling it have been upwards of a million and a half of dollars in a single year. We glean these facts from an interesting article by Mr. C. H. Collette, published in *The Hour*, a London journal, of August 3. It is the repetition of a familiar story. Too often has it been the fate of the inventor to labor only to see other men enter into the fruit of his labors.

Ingenuity in Milk Adulteration. — It has been said that the only way to be sure that you get undiluted milk is to have the milking done under your own eye, but even this cannot always be depended upon. In Europe, where asses' milk is much esteemed for its curative properties, it is a common thing to lead the animals to the customer's door to be milked. A recent Continental traveller, referring to this custom, asserts that "the ass-milkers in the Italian towns usually carry a bladder of lukewarm water under their cloaks, kept up to the heat of the body under the armpits, of the contents of which they furtively infuse a portion into the several milk-jugs in the face of the domestics, who never suspect the trick. Thus are poor patients, when given up by the faculty and sent to languish under an Italian sun, and die, turned over to the tender mercies of tricksters, generally the associates or creatures of cheating hotel keepers."

A New Use for Telegraph Wires. — According to *Iron* the Yankee notion of metallic clothes-lines has been anticipated in the far East. "Armenia, said to be the cradle of the human race, evidently preserves a certain amount of ancient simplicity, and is refreshingly free from the corruptions of modern science. The director of the telegraphs at Erzeroum, Shefket Effendi, being puzzled at the frequent breakages of the wires under his charge, made recently a journey of inspection along the line, and found to his chagrin that the breakages had been caused by the washerwomen in its neighborhood, who, in utter guilelessness, were in the habit of overloading the wires with 'things from the wash,' articles of attire male and female. Shefket Effendi

was obliged to interdict the use of the telegraph in aid of that virtue which is next to godliness; but we hope, notwithstanding, that these primitive people may still wash and be clean."

An English Country Churchyard. — Many of the country churchyards in England are as lovely as the one which Gray has made the scene of his Elegy, but there are others in which no poet or sentimentalist would like to meditate among the tombs. The state of the one in the parish of Talland, in Cornwall, according to an account in a sanitary journal, is almost incredibly revolting. "Nearly 8000 people lie buried in about half an acre of ground, the soil of which is so shallow that the graves cannot be dug deeper than about 4½ feet. Repeated burials have, however, so raised the level in the vicinity of the church that the sacred edifice appears as if situated in a pit, and from the higher part of the graveyard there is continually oozing upon the floor of the belfry a horrid slime; to save the ringers from the poisonous effect of which, disinfectants have to be used. The church has actually become, in consequence, unfit for public service. The air on Ash Wednesday was so fetid that the congregation had to withdraw; while flowers employed for decorative purposes became almost black by a day's exposure to the mephitic atmosphere. It is characteristic that after all these facts had been laid before the vestry, that body refused, by a majority, to take any steps towards the establishment of a cemetery. That, however, will probably be undertaken by the central authority."

ATOMS.

At Konigshüte, in Germany, a medical examination of certain children enrolled for revaccination gave rise to a report that the Old Catholic priest, Dr. Kaminski, who was present at the proceedings, intended to bring about the conversion of the children to Old Catholicism, and a number of women got up such a riot that the military had to be called out. — A Western botanic doctor spells cayenne "cian," and wild cherry "yld cherry," which last phonetic orthography reminds one of the man who spelled wife "yf." — Two prominent physicians of Kingston, Ulster Co., New York, have been indicted by the grand jury of that city for mistaking a case of small-pox for chicken-pox, thus causing the spread of the former disease. — The *New England Journal of Education*, in a notice of our number for July, says: "The instruction of the Journal of Chemistry has been made practical to the family as well as to the school, and if our word could work the result, we would double its usefulness by a doubled subscription list this year." — The value of the water-cresses sold in Paris is estimated at $800,000 a year. — A medical contemporary revives the old but good story of the man who, when waited upon with his doctor's bill, after cogitating for some time over its contents, desired the young man who called with it to tell his master that the medicine he would pay for, but he should return the visits. — An English paper suggests that an old gun loaded with a heavy charge of powder, and hung near the rafters in any dangerous locality about a factory, makes an excellent fire-alarm, an explosion being caused by the heat. — Dr. Obet, to whose recommendation of chloral in sea-sickness we have elsewhere referred, suggests also that the victims of that malady will do well, instead of limiting themselves to the five meals a day of Atlantic steamers, to follow Dr. Brown-Séquard's mode of treating dyspepsia with obstinate vomiting, the patient taking every quarter or half hour one or two mouthfuls of bread and meat or other food, with a little iced champagne. — Straw matting should be washed with a cloth dampened in salt water; Indian meal sprinkled over it and thoroughly swept out will also cleanse it well. — One of the shafts of a silver mine in Bohemia has been carried to a depth of 472.18 metres (about a quarter of a mile) below the level of the sea. — Steel rails are being laid on the line between Rome and Naples. — The metrical system has been introduced into Egypt. — New coal fields have been discovered in Brazil. — The Japanese are setting up blast furnaces for utilizing the ores of the country, which are said to contain 50 per cent. of metallic iron. — A Belgian manufacturer, L. Chélot, manufactures five-sided wire, which gives a better grip than wire with a cross-shaped section, the advantage being 20 per cent. in pine, and 30 per cent. in oak. — A patent has been taken out in France for two lubricants compounded as follows: (1) graphite, 35 parts; talc, 25; sulphur, 20; wax or paraffine, 20; (2) graphite, 30 parts; bone glue, 15; water, 32; sulphur, 12; wax or paraffine, 11. — Cast-iron blocks, 2 feet by 3 feet 5 inches, and 7 inches in depth, weighing 200 lbs. each block, are being laid in the principal streets of Warsaw; the blocks are laid in rows of five blocks, or 17 feet 1 inch wide, upon a layer of small stones, carefully levelled, and finished with gravel. — A singular establishment is kept up at Pantin by a M. Patrian, contractor for public lighting; it is in reality a factory and warehouse for the manufacture and sale of oxygen, which is kept stored in metallic reservoirs under a heavy pressure, and delivered for such purposes as the lighting of theatres and cafés, blowpipe use, inhalation and ventilation, and air-baths. — M. Leverrier is making arrangements for an electrical connection between the clock of the observatory and the public clocks of Paris. — The "smallest Bible ever produced" has just been issued at the Oxford University Press; it is printed on a rough, unbleached India paper, of extreme thinness and opacity; is 4½ inches high by 2¾ inches broad, and half an inch in thickness; weighs, bound in limp Morocco leather, less than three and a half ounces. — Mr. M. D. Conway's interesting description of the South Kensington Museum is continued in *Harper's Magazine* for October, with excellent illustrations of many of the art treasures in that admirable institution. — Wah-Sing (it ought to be Wash-Ing) has opened a Chinese laundry in Boston, and these celestial establishments are getting to be quite common in our city. — A Mr. Lockwood, who has been actively engaged in the introduction of condensed milk into England, has now taken out a patent there for the manufacture of "concentrated beer," which is ordinary ale or stout evaporated in a vacuum pan, the alcohol being secured as it distils over, and afterwards mixed with the semi-solid mass, which occupies only about one tenth of the space of the original liquid. — We are glad to see that a "carefully revised" edition of Dr. Vogel's *Light and Photography* is being prepared for the "International Scientific Series." — The Prussian government has offered a prize of 10,000 marks (about $2500) for a new plaster for art purposes, that will not discolor or deteriorate by washing or exposure to the weather. — The publication of the *Journal of Applied Chemistry* has been given up.

LITERARY NOTES.

The Appletons have reprinted Dr. H. C. Bastian's *On Paralysis from Brain Disease*, a series of lectures delivered at University College Hospital and afterwards published in *The Lancet*, where they attracted a good deal of attention At the request of many friends the author has republished them in book form, after careful revision and the addition of much new matter. The subject is one that involves many difficult and perplexing questions, but Dr. Bastian is eminently qualified to deal with it and has treated it with marked ability.

The same publishers have now ready the *Primer of Roman History*, by M. Creighton, which summarizes the philosophy as well as the facts of the history of Rome very briefly yet very skilfully.

Lessons on Prescriptions and the Art of Prescribing, by Prof. W. H. Griffiths (Macmillan & Co.), is a series of familiar lectures to medical students in Dublin, but equally useful to the student and practitioner here. A leading medical journal commends it as "brief, clear, complete, and presenting all that is needed on the subject, without useless amplifications." The practical examples and exercises in prescribing are specially valuable.

A Manual of Introductory Chemical Practice, by Professors Caldwell and Breneman, of Cornell University (published by the authors), is a "new departure" in text-books of the science. It is essentially a book of experiments, which the student is to perform in the laboratory, giving his results and conclusions in writing. While he is doing this practical work, he is to learn theoretical chemistry from lectures or recitations in one of the ordinary text-books. The plan is a good one on the face of it, and the authors assure us that it has worked well with their classes.

Fortification is one of the most important of the arts of war, and one of which the student of history needs to have at least a smattering, but it is fearfully dry and uninteresting as presented in technical treatises. M. Viollet-le-Duc has, however, contrived to make it really attractive in his *Annals of a Fortress* (a translation of which has just been published by Osgood & Co.), by working it into a kind of historical fiction. He takes an ideal fortress on the Saone, tells how it would have been built, attacked, and defended in the old Gallic days, and successively in Roman, mediæval, and modern times. Its fortunes are thus traced through seven sieges, each of which is described as graphically and at the same time as accurately as a chronicler of the period would have done it. The many excellent illustrations and the full glossary of technical terms make all the details of the subject clear even to a juvenile reader.

Prof. Sanborn Tenney's *Manual of Zoölogy* (Scribner, Armstrong, & Co.) is intended for use in higher schools and colleges, and for popular reading. It gives a good general outline of the animal kingdom, and is to be commended to American students and readers in preference to books prepared abroad, from the fact that it gives special prominence to North American zoölogy. The illustrations, of which there are 500 or more, have also the merit of freshness, being drawn either from nature or from the latest and best authorities. It is in all respects worthy the attention of the teacher.

Guyot's New Intermediate Geography (same publishers) is an entirely new book, embracing such improvements as the practical use of its predecessor in the series has suggested, and therefore likely to bear well the test of the schoolroom. It may be found, with all the other books of the day, at Lockwood, Brooks, & Co's.

Prof. Walter Smith's series of *Text-Books of Art Education*, the earlier issues of which have been several times commended in our columns, are now published by Messrs. L. Prang & Co., of this city. The complete series will comprise Drawing Cards for slate practice in primary schools; a set of "Intermediate Drawing Books" for free-hand drawing in intermediate schools; courses in free-hand, geometrical, model and object, perspective, mechanical, and architectural drawing for grammar and high schools; with a "Teacher's Manual" adapted to each grade of instruction. With the exception of the mechanical and architectural drawing-books, most of these are now published and in successful use in hundreds of schools. Teachers who are not already acquainted with them should examine them before deciding upon text-books in drawing. They are skilfully graded to the special needs and aptitudes of the several classes of pupils for whom they are intended, and the "Teacher's Manuals" give all the information that the instructor, however inexperienced in this department, can desire. It is said that in Japan every child is taught to draw, and we may hope that the same will ere long be true of this country. If this does not come to pass, it will not be for lack of the means of instruction.

Messrs. A. S. Barnes & Co. have published *Peck's Manual of Algebra*, a revised and much improved edition of a book which, though intended for college use, has been adopted in many academies and high schools. The simplicity and clearness with which the difficulties of the subject are treated is doubtless the secret of its popularity in schools of such widely different grades.

A *Text-Book of Poetry*, by Rev. H. N. Hudson (Ginn Bros.), contains selections from Wordsworth, Coleridge, Burns, Beattie, Goldsmith, and Thomson, with introductory biographical sketches which are models in their way, and notes which seem to us too few and brief for average teachers and scholars.

Representative Names in the History of English Literature, by H. H. Morgan (Ginn Bros.), is a thin octavo of 47 pages, containing in a sort of tabular form lists of 72 English and 58 American authors, with supplementary or subordinate mention of 48 English and 53 American. The relative rank assigned to some authors is open to criticism. For instance, "Bull Run Russell" is put in the first list of English names, while Edmund Burke and Sir Isaac Newton are relegated to the second; and of American writers, W. A. Butler, A. B. Meek (of whom we confess we never heard before), Mark Twain, and C. D. Warner are in the higher rank, while Thomas Jefferson, Judge Story, and Agassiz are admitted only to the lower. Of Shakespearian editors, Hudson is in the first list, Verplanck and White in the second; and so on.

Allen and Greenough's *Latin Composition, Part I.* (Ginn Bros.), cannot fail to prove a good book in the hands of a competent teacher.

The Electrical News is a new weekly journal, edited and published by W. Crookes, F. R. S., and uniform in size and style with the well-known *Chemical News*. It fills a gap in scientific periodical literature, and promises to fill it well. It has been added to our "Clubbing List."

Medicine and Pharmacy.

NOTES ON SALICYLIC ACID.

Dr. Hanow, in a Berlin medical journal, states that he has found salicylic acid a valuable remedy in diphtheritis. He uses the acid in solution, one part to three hundred, as a gargle, or in the stronger solution which is made by the addition of phosphate of soda. The gargle is used hourly, and in the cases under Dr. Hanow's care relief was obtained very shortly. After the third or fourth dose the membrane began to separate, and with the diminishing of the exudation the fever began to disappear, convalescence setting in after twelve hours.

Dr. Fontheim also reports that he has treated with salicylic acid thirty-one patients having diphtheria. The severest cases were cured by eight days' treatment; the milder ones in two, three, and four days. Of the thirty-one cases, none died. There occurred no cases of diphtheritic inflammation of the kidneys, nor were there any cases of paralysis of the palate. In the severe cases, Dr. Fontheim ordered the affected parts to be rubbed every three hours with a sponge dipped in a solution of salicylic acid, and to take as regularly a teaspoonful of the same solution. The formula used was: Salicylic acid, 2 grammes (about ʒss.); water, 200 grammes (about ʒvij.); alcohol, q. s. (to make fʒvij.).

To children too young to gargle, Dr. Wagner, of Fribourg, gives salicylic acid in water or wine in doses of 10 to 30 centigrammes (about 1½ to 4½ grains) every two hours. For those who are older he prescribes the following gargle: —

Salicylic acid	150 parts.
Alcohol (to dissolve it)	15 parts.
Distilled water	150 parts.

To be used every two hours. If the solution deposits any crystals he dissolves them by warming it. He reports fifteen serious cases of diphtheria cured by this method.

A writer in the *Pharmaceutische Zeitung* states that a quarter of a gramme (about four grains) of salicylic acid will prevent the development of fungi in three pounds of fresh lime juice, the latter being in a half-filled flask. A trial made under similar conditions, but without the salicylic acid, resulted in the formation of mould in ten days. It was also found that cream which refused to churn could readily be made to do so by the addition of a very small quantity of this acid.

Another pharmacist remarks, in the same German journal, that salicylic acid is a useful addition to the water in which leeches are kept, preserving it in a sweet and clean condition. After several experiments he came to the conclusion that the most advantageous proportion was 20 drops of an aqueous solution of salicylic acid (1 in 300) to a litre or about a quart of water, in which a hundred leeches were kept.

Dr. Hager recommends the use of the following powder for excessive sweating of the feet: Burnt alum, five parts; salicylic acid, two and a half parts; wheat starch, fifteen parts; Venetian talc, fifty parts; mix and make a very fine powder.

HAY FEVER.

Some three years ago Dr. Morrill Wyman, of Cambridge, published a valuable monograph on autumnal catarrh, or "hay fever," as it is popularly called. The volume was not stereotyped, and is long since out of print; but the author has recently contributed to the *Boston Medical and Surgical Journal* an interesting paper on the subject, from which we take the following suggestions as to the treatment of the disease: —

First, of preventive measures. The direct rays of the sun are to be avoided during the hot weather, as having a debilitating influence on the nervous system. Avoid the smoke and dust of the railway train, and the dust of the street; avoid also those plants, such as Roman wormwood, golden-rod and other flowers and fruits, which are known to bring on an attack. The sleeping-room should have an open fire-place, should not be exposed to the afternoon sun, and after being well aired for an hour in the early morning should have the windows and doors closed, and kept closed, so that the air shall be as still as possible until the following morning. We think the still air allows the injurious particles to subside; but whether this be so or not, we are satisfied that this course has given us a good night's sleep and a better condition in the morning. The diet should be nourishing, containing animal food. Alcoholic stimulants should be avoided. Flannels worn from the middle of August, and increased in warmth as the season and disease advance, give protection against sudden changes of temperature, to which both the skin and the nervous system are very sensitive, and between which, at this time, there is a close sympathy.

Of all the medicines we have as yet fully tried, quinine, in our opinion, has done most good as a preventive and also as a relief of some of the most annoying symptoms. Whether it has specific properties or not we cannot say, but it is generally acknowledged to be a good tonic to increase the appetite, and is probably an aid to the digestion and appropriation of food. Its use should be commenced a week or ten days before the usual return of the disease, and continued through its course in doses of one or two grains with each meal. Bromide of potassium, in doses of ten or fifteen grains dissolved in cold water, will often relieve the irritability and restlessness so often annoying even when the other symptoms are slight. Gentle saline or other laxatives are useful, but violent purging should be avoided.

Of remedies to be used for the relief of paroxysms of itching of the eyes, mouth, and throat, great numbers are recommended. These very troublesome symptoms may be often greatly relieved by the local application of a saturated watery solution of quinine, made without the addition of any acid. The best mode of using it is with an atomizer or, what is quite as good, the perfume distributer in common use; the spray from the clear solution being thrown into the eyes and throat, drawn into the lungs as freely as possible, and also thrown over the skin of the face. It should be used many times daily. Bathing of the eyes in cold or tepid water relieves, and the same may be said of the mild sedative solution of two or three grains of borax to an ounce of camphor water, a favorite prescription of the oculist. Avoid as much as possible accesses of sneezing; they are the beginning of trouble to both eyes and nose.

The irritation and discharge from the nostrils may be relieved by the "head bath;" holding the head for five minutes over a bowl of very hot milk and water or water alone, the head and shoulders meanwhile covered with a shawl. In railway travelling and on dusty roads much relief is gained by placing small pieces of wet sponge just within the nostrils, or covering the whole face with Swiss muslin wet with water. The nostrils are often completely obstructed early in the morning, and swallowing impeded; this may be relieved temporarily by active movements of the limbs for a few minutes, — leaping or running quickly up-stairs, — after which one can often eat his breakfast with comparative comfort.

For the night a closed room, and, if opium can be taken without inconvenience, six or eight grains of Dover's powder, or an equivalent in laudanum or a solution of morphine, often give more or less freedom from that most annoying symptom in the latter stages, the spasmodic cough. It may also be relieved by the spray from the watery solution of quinine as just mentioned. The common household mucilaginous remedies, gum arabic and flaxseed tea, for temporary relief are not to be rejected. The asthma, like that occurring at other seasons and produced by other causes, is often spasmodic, nervous, and wayward; it is relieved by a variety of remedies; the inhaling of smoke from burning stramonium leaves and saltpetre, three parts of the former to one of the latter, probably gives as much relief to a majority of sufferers as any other treatment.

We have here sketched an outline of treatment, avoiding all theories as to the cause of the disease, a knowledge of which, however desirable in other respects, would not perhaps guide us to a better result than we can obtain from our general knowledge of the character of the symptoms.

SANITARY ADVICE IN VERSE.

The following verses contributed to *Public Health*, an English sanitary periodical, by Sir Alfred Power, are not likely to find a place in "Little Classics" or any similar poetical anthology, but they cannot be called "rhymes without reason:" —

There 's a skin without and a skin within,
A covering skin and a lining skin;
But the skin within is the skin without
Doubled inwards and carried completely throughout.

The palate, the nostrils, the windpipe, and throat,
Are all of them lined with this inner coat,
Which through every part is made to extend —
Lungs, liver, and bowels, from end to end.

The outside skin is a marvellous plan
For exuding the dregs of the flesh of man;
While the inner extracts from the food and the air
What is needed the waste in his flesh to repair.

While it goes well with the outside skin,
You may feel pretty sure all 's right within;
For if anything puts the inner skin out
Of order, it troubles the skin without.

The doctor, you know, examines your tongue
To see if your stomach or bowels are wrong;
If he feels that your hand is hot and dry
He is able to tell you the reason why.

Too much brandy, whiskey, or gin
Is apt to disorder the skin within;
While, if dirty or dry, the skin without
Refuses to let the sweat come out.

Good people all! have a care of your skin,
Both that without and that within;
To the first you 'll give plenty of water and soap,
To the last little else beside water, we 'll hope.

But always be very particular where
You get your water, your food, and your air;
For if these be tainted, or rendered impure,
It will have its effect on your blood, be sure.

The food which will ever for you be the best
Is that you like most, and can soonest digest;
All unripe fruit and decaying flesh
Beware of, and fish that is not very fresh.

Your water, transparent and pure as you think it,
Had better be filtered and boiled ere you drink it;
Unless you know surely that nothing unsound
Can have got to it over or under the ground.

But of all things the most I would have you beware
Of breathing the poison of *once breathed* air;
When in bed, whether out or at home you may be,
Always open your windows and let it go free.

With clothing and exercise keep yourself warm,
And change your clothes quickly if drenched in a storm;
For a cold caught by chilling the outside skin
Flies at once to the delicate lining within.

All you who thus kindly take care of your skin,
And attend to its wants without and within,
Need never of cholera feel any fears,
And your skin may last you a hundred years.

MEDICAL MEMORANDA.

Feeding Babies with Starch. — A friend, after reading an article on this subject in the Journal, remarked to us that he could hardly believe it possible that infants ever seriously suffer in that way. He thought that enough of milk or other nitrogenous food would inevitably be mingled with the starch diet to save the child from starvation. The following from the London *Sanitary Record* shows that the danger is not a purely theoretical one: —

"Dr. W. Domett Stone writes to a contemporary, stating that his attention has been called to a report of a trial at Taunton, last Saturday, of a married woman, on a charge of starving her twin children to death by feeding them on what is called 'corn flour,' which she had been warned by her medical man was incapable of sustaining life. Death in both instances having clearly resulted from partaking of this preparation, it cannot, he contends, be too widely known that 'corn flour' *per se* is not food, but pure starch, prepared by washing out of maize flour the nutritive portion with alkalies, as was abundantly proved by the evidence of Dr. Bartlett before the Adulteration Committee of the House of Commons last autumn.

"Numerous instances of children reduced to skin and bone, from being fed on one or other of the 'corn flours' now before the public, have come under his notice. It may be of some use to your readers to have a 'rough-and-ready' test to distinguish those farinaceous foods which are innutritious. Whenever the powder is beautifully white and of extreme fineness the article should be rejected, as being almost certainly composed of starch alone. When, however, the nutrition has not been sacrificed to appearance, and they present their natural brownish color, some of these foods may contain even more nourishment than meat."

Therapeutical Effects of Oxygen. — The *Gazette Médicale de Paris* states that M. Tamin-Despalle, in a paper read before the Academy of Sciences, says that a patient of his was attacked with severe cerebral congestion at two P. M. He fell, and on recovering himself found that the whole of the right half of the body was paralyzed. The pulse was 82, and the face livid. He had taken a hearty meal about half an hour before. M. Tamin-Despalle thought he ought not to bleed, or administer an emetic. He ordered inhalations of pure oxygen. After the first few inspirations the patient felt better, and the power of motion and sensibility returned in the paralyzed side. At seven P. M., having taken in all about eight quarts of pure oxygen, he was well.

Counting the Blood Corpuscles. — A Monthyon prize has been given to M. Malassez for researches on blood. He has contrived an instrument said to be superior to those previously used for ascertaining the number of red corpuscles in a given space. It consists of a capillary tube, into which blood and artificial serum are introduced, and which is graduated so that the contents of a given length are known. The mean number of red corpuscles in human blood is 4,000,000 in each cubic millimetre. A greater number is found in small arteries than in large, and in veins than in arteries, and most in veins that have lost part of their serum by exosmose. They are fewer in cases of cancer and tuberculose. Lead poisoning also lessens their number.

The Acid of the Gastric Juice. — Whether the acidity of the gastric juice be due to lactic or hydrochloric acid is still an open question. The former view rests on the authority of Prout, Graham, Schmidt, and others, while the latter is maintained by Bernard. Rabuteau has investigated the point afresh, employing a new method which he describes in the *Comptes Rendus*. He obtains the juice from the stomach of a dog which has been allowed to fast for twenty-four hours, and has then been fed on bits of tendon. To the liquid, after filtration, pure quinia is added so long as it will dissolve. It is then dried *in vacuo*, and the residue treated, first with amylic alcohol, then with chloroform or benzine; the latter agents being able to dissolve many salts of quinia, while refusing to take up the mineral chlorides. On evaporation, the solvent leaves a pure hydrochlorate of quinia. Other analyses showed the absence of any trace of lactic acid. Quantitative determinations yielded 2.5 parts of hydrochloric acid in 1000 of gastric juice.

NOTES FROM ABROAD.

Webb's Swim across the English Channel. — Leander's mythical feat of swimming the Hellespont, and the recent exploit of Boyton in the English Channel, are insignificant compared with Captain Webb's extraordinary passage of the latter body of water. The achievement has a physiological interest as showing the endurance and heat-sustaining powers of the human body under such abnormal circumstances. The *British Medical Journal* remarks: "The unprecedented exploit of Captain Webb stands almost unrivalled as an instance of human prowess and endurance. It places Captain Boyton's achievement completely in the shade as an exploit, though its practical utility to the species may be much less. It is not merely that Captain Webb is a daring and accomplished swimmer, of unusual powers of endurance as regards sustained muscular efforts; the great question is, By what arrangement or modification of his heat-producing and heat-conserving processes did he manage to sustain his twenty-two hours' immersion? It is notorious that J. B. Johnson's attempt to swim the Channel two years ago ended in complete failure after an hour's immersion; and yet J. B. Johnson is no ordinary swimmer, but a stalwart fellow, possessing good powers of endurance. There must exist in Captain Webb's case strong contractile power in the vessels of the skin, by which his body-heat was conserved, and his stores of force thus rendered available for muscular effort. Combustion within the body produces heat and mechanical effort, and when the powers are taxed to produce heat, or the temperature falls, muscular effort fails partially or absolutely. But, though wearied, he fulfilled his task; and if his immersion be followed by no pyrexia, then Captain Webb's heat-regulating powers must be regarded as of no ordinary character. How far and to what extent the porpoise-oil prevented heat-loss, and so aided in the result, is a factor that can only be appraised when others have tried it, and seen how far it will enable them to undergo the heat-loss of prolonged immersion. That it will have an effect is certain, as in cold regions it is usual to grease the body thoroughly in order to retain its heat. But, admitting all this, there would still appear to be peculiarities in the vaso-motor nerves which make the difference, and which have made Captain Webb's achievement *un fait accompli*."

Opium Smoking in China. — The following extract from a report made to the Foreign Office by the British Vice-Consul at Kiukiang appears to show that the pernicious effects of opium smoking upon the Chinese have been exaggerated, or at least that the rule is not without its exceptions: —

"During my tour on the Upper Yang-tsze and in Szechuen I was thrown into the closest relations with junk sailors and others, almost every adult of whom smoked more or less, and I was much struck with the effect it had on them. Their work was of the hardest and rudest, rising at four and working, with hardly any intermission, till dark, having constantly to strip and plunge into the stream in all seasons, and this when in the most dangerous parts. The quantity of food they eat was simply prodigious, and from this and their work it seems fairly to be inferred that their constitution was robust. The two most addicted to opium were the pilot and the ship's cook. On the incessant watchfulness and steady nerve of the former the safety of the junk and all on board frequently depended; while the second worked so hard from three A. M to ten P. M., and often longer, and seemed so independent of sleep or rest, that to catch him seated or idle was sufficient cause for good-humored banter. This latter had a conserve of opium and sugar, which he chewed during the day, as he was able to smoke only at night. I do not imagine that the Szechuen drug differs sufficiently from the Indian to account for these instances of harmless smoking; nor, on the other hand, do I wish to express it as my opinion that opium smoking does no harm; but my opinion with regard to it has been much modified; and I am bound to recognize the fact that the habit can and does exist without detriment to health or capability, merely affording a solace and a stimulant."

Force and Stimulants. — The London *Lancet* remarks that at the present day our treatment has assumed a character too decidedly stimulant and not quite sufficiently nutritive. Stimulants ought to be regarded as auxiliaries to nutrition more than they are at present. Nutritive material, as milk, meat-juice, eggs, and various forms of starch, ought to form a greater matter in the dietary of the sick than stimulants, whether nitrogenized or alcoholic; such materials, when assimilated, give supplies of force. Stimulants may assist in their assimilation, and do so; but in themselves stimulants only furnish limited supplies of force-bearing material. They are, however, a means by which the system may reach some of its physiological reserve fund. Such use may be advantageous or pernicious, according to circumstances; and an ill-regulated or excessive process of stimulation may give results as disastrous as a wise and intelligent resort to stimulants may be beneficial and preservative in its consequences.

The Antiphlogistic Action of Carbolic Acid. — Professor Hueter, of Greifswald, in a paper read before the German Surgical Society, called attention to the antiphlogistic action of parenchymatous injections of carbolic acid. He has used this treatment with success in white swelling of the joints, in subacute inflammation of the lymphatic glands, in acute phlegmonous inflammations, and in traumatic erysipelas. The injection fluid consists of a two per cent. watery solution of carbolic acid. This strength may, however, be increased. Two grammes may be injected at one time.

HISTORY AND ANECDOTE.

The Black Death of the Fourteenth Century. — In a late number of *Land and Water*, Mr. Frank Buckland writes: "When examining the monuments in the cloisters of Westminster Abbey a few Sundays ago, I found on the large tombstone let into the floor of the south cloisters of Abbas Du Blois — who died A. D. 1100 — an inscription which has been cut in since my father's reign as dean. Dr. Stanley has probably, with his usual praiseworthy research, ascertained the facts, and has caused to be

recorded, that under this very stone lie the remains of 'twenty-six monks of Westminster, who died of the black death in 1348.' Being desirous of knowing something about the 'black death,' I consulted my learned friend, Signor Valetta, who kindly writes me: 'The black death of 1348 must have been the same which, coming from Asia, ravaged Italy, killed the Laura of Petrarch, and was the theme of the famous Decameron of Boccaccio, that is to say, of the one hundred novels told in ten days by a party of ladies and gentlemen in a villa near Florence — Decameron, from the Greek, meaning ten days.' I subjoin the authority of B. Lambert in the 'History and Survey of London,' etc. . . . 'Were soon damped by a terrible pestilence, which is said to have spread from India over all the country westward of it, and reached England in 1348, where it destroyed immense numbers of the inhabitants, so that it was computed that in the city of London no more than one in ten survived the mortality. . . . This shocking distemper continued so long that the common cemeteries were not large enough to receive the dead bodies, which induced several well-disposed people to purchase ground for that purpose,' etc.

"I hear from the Rev. Mr. Maskell, of Emanuel Hospital, that many thousand were buried in the environs of Charter House, etc. Boccaccio asserts in his preface to his Decameron that in Florence alone the distemper carried away some one hundred thousand souls!"

Quinine in 1694. — John Evelyn, in his "Diary," states that "on visiting the Marquis of Normanby, November 29, 1694, he had much discourse with him concerning Charles II. being poisoned; also concerning the *quinquina*, which the physicians would not give to the king at a time when, in a dangerous ague, it was the only thing that could cure him (out of envy because it had been brought into vogue by Mr. Tudor, an apothecary), till Dr. Short, to whom the king sent privately to know his opinion of it, he being reported a Papist (but who was in truth a very honest good Christian), sent word to the king that it was the only thing which could save his life; and then his Majesty enjoined his physicians to give it to him, which they did, and he recovered. Being asked by Lord Normanby why they would not prescribe it, Dr. Lower said it would spoil their practice, or some such expression, and at last confessed it was a remedy fit only for kings."

What 's in a Name? — The *London Medical Times* tells a humorous story of the late Sir Charles Locock, as an evidence of his powers of repartee. His great repute had induced certain vendors of quack medicine to advertise cough lozenges under the title of "Locock's Pulmonic Wafers," or "Locock's Cough Lozenges." This, of course, caused him some annoyance. One morning he met the Duke of Wellington in Hyde Park, who said, "Locock, I have a bad headache from taking your damned lozenges." "Well," said Sir Charles, "I might as well say that I am lamed by wearing your damned boots, for I wear Wellington boots."

A Characteristic Letter by Jenner. — When Clive wrote to Jenner assuring him that if he came to London he would earn £10,000 a year, Jenner replied: "Shall I, who even in the morning of my days sought the lowly and sequestered paths of life in the valley, and not the mountain, shall I, now my evening is fast approaching, hold myself up as an object for fortune and for fame? Admitting it as a certainty that I obtain both, what stock should I add to my little fund of happiness? And as for fame, what is it? A gilded butt, forever pierced with the arrows of malignancy."

Anæsthesia Two Centuries Ago. — The practice of anæsthesia in ancient surgery is referred to by Middleton, the old dramatist, 1657, thus: —

> "I 'll imitate the pities of old surgeons
> To this lost limb, who, ere they show their art,
> Cast one asleep, then cut the diseased part."

CHLORALIANA.

Chloral in Sea-Sickness. — Some months ago we quoted a recommendation of chloral as an antidote to sea-sickness by M. Giraldes; and now Dr. Obet, who has been engaged as a physician for four years past on the French line of steamers between Havre and New York, states, in the *Archives de Médecine Navale*, that of the many remedies which he has tried upon passengers suffering from "naupathie" or sea-sickness, chloral is by far the best, and is indeed very efficacious. Bromide of potassium, which, before the introduction of chloral, was the substance that did most good, is far too slow in its effects, and requires to be given in too large doses before any marked effect is produced, while the quantity of water necessary to enable it to be swallowed forms a serious obstacle to its employment in this affection. Chloral, on the contrary, given in the form of syrup, in a dose of from 1 to 1½ or 2 grammes, procures a calm and tranquil sleep, on awakening from which the patient finds himself, if not completely cured, at least in a state of relative comfort. On the first day of the voyage, this sleep should be at once secured by giving the patient 1 gramme (15 grains) at a single dose, and the following days 1½ or 2 grammes may be given during the day, by taking a spoonful of the syrup every hour. As a general rule under this plan, in two or three days the sick passengers have become accustomed to the sea, and are even able to take their meals at the table. The chloral, to be useful, must always be free from all alteration, and from the action of humidity. When it has not been kept in a very dry place, so that it has become somewhat deliquescent, in place of the calm sleep so much desired, it may produce nervous irritation, sometimes of great violence.

Chloral Hydrate. — In confirmation of what has already been said of the advantage of combining soda with chloral hydrate, Professor König writes as follows to a German pharmaceutical journal: "The narcotic power of chloral hydrate is increased to an important extent, and its prejudicial effects reduced in the same proportion, if bicarbonate of soda be administered immediately before. After five observations I believe myself to be in a position to state that 1 part by weight of chloral hydrate may be replaced with equal effect by 1 part of bicarbonate of soda and 0.4 part of chloral hydrate. Since, calculated from the average manufacture of chloral hydrate, more than a hundred thousand persons daily use the sleep-producing medicine made known a few years ago by Professor Liebreich, some may find it both useful and interesting to test my conclusion, which was indeed probable from theoretical considerations."

PHARMACEUTICAL PYROTECHNY.

Curious Action of Glycerine upon Borax. — Mr. F. Long writes to the *British Medical Journal*: "I had occasion to make an alkaline lotion for a case of acne a short time ago, which consisted of borax, bicarbonate of soda, chlorate of potash, glycerine, and water. After the ingredients were put in and the bottle filled with water, I added half an ounce of glycerine, and corked the bottle. To my surprise, in a few seconds violent action began to take place, and I was obliged to remove the cork for fear of an explosion. I could not understand what had taken place, and could only think that there was some acidity in the glycerine. But such was not the case — it was perfectly neutral to test-paper; and the other chemicals, I believe, were perfectly pure. I then repeated the experiment in the following way, and a very interesting one it was, perfectly inexplicable to me, and of which I can gather no information from any work. I put into a test-tube about equal parts of powdered borax and bicarbonate of soda, with a little water; I then added some glycerine, which, of course, sank through the solution of soda, and rested over the borax; chemical action immediately began, the glycerine gradually became dissipated, and the borax was dissolved. I have repeated the experiment several times, and have obtained the same result with the carbonate, although not to the same amount. The change is evidently at the expense of the glycerine; for if only a few drops be added, the action soon stops, to be renewed with great intensity if a large quantity be then added. I am not sufficient chemist to unravel the decomposition."

An Explosive Prescription. — *The Pharmaceutical Journal*, of Vienna, states that the following prescription was sent to a pharmacist: "Chromic acid, eight grains; glycerine, one drachm. For external use." The dispenser dissolved the acid with a little water in a phial by a slight shaking; the glycerine was then poured in, and the phial again shaken. Thereupon the compound exploded with a very loud report, and was projected with force to the ceiling of the shop. The phial, which did not break, became coated with a black pigment, and remained in the hand of the frightened dispenser. The case deserves attention from the fact that the ingredients were in such small quantities and the explosion so powerful.

SELECT FORMULÆ.

For Intermittent Fever. — The following is commended by the *Eclectic Medical Journal of Pennsylvania*, as an excellent preventive for intermittent fever: —

Cincho-Quinine	45 grs.	
Leptandrin	15 "	
Xanthoxylin	8 "	M.

Ft. pilulæ xxx. Sig. One, night and morning.

Anti-Catarrhal Pills. — We find this recipe in the *Philadelphia Medical Times*: —

Gum. ammoniac.	gr. xxx.	
Ammonii carbonat.	gr. xv.	
Ipecac. pulv.	gr. iij.	
Morphiæ muriat.	gr. iss.	
Mucilaginis	q. s.	M.

Ft. in pil. no. x. Coat with balsam of tolu dissolved in chloroform. Take one pill morning and evening in chronic bronchitis.

CINCHO-QUININE.

The following highly complimentary letter in relation to Cincho-Quinine has just been received: —

Lee Centre, Ill., *September* 13, 1875.

Messrs. Billings, Clapp, & Co:

Dear Sirs, — I have used your goods extensively during the past thirteen years, and have learned from actual experience to feel a degree of confidence in their purity and integrity which is only possible while using the preparations sent out by very few of the manufacturers of the present day. I find I have over seventy empty Cincho-Quinine bottles among the rubbish of my office, and of course some have been destroyed or removed. My experience with Cincho-Quinine has therefore been large enough to warrant me in having a decided opinion of its merits, and I unhesitatingly say that in my hands it has proved far superior to quinine; not only as an antiperiodic, but as a tonic without stimulation, and almost, if not quite, without that tendency to congestion of the brain which is so marked an effect of quinine. It can therefore be used to very great advantage in most cases of remittent and congestive malarial fevers, in which quinine, although we were formerly forced to use it, can be employed only at a great disadvantage. As an antiperiodic I use Cincho-Quinine in smaller doses, and find its action more effective, and particularly more permanent, than I ever obtained from quinine.

C. E. Loomis, M. D.

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Familiar Science.

OXYGEN IN THE ARTS AND IN MEDICINE.

EVER since the discovery of oxygen by Priestley in 1774, it has been the dream of chemists that some simple and cheap means of obtaining it on the large scale might be devised, and that this might lead to important applications of the gas in the industrial arts. As the ocean of air that surrounds the earth contains 21 per cent. of oxygen, not in a state of combination but simply mixed with other gases, this has naturally seemed the most promising source from which to obtain the gas in a pure form, and inventive skill has been tasked to contrive some ready and effective method of separating it from the atmospheric mixture. Several very ingenious processes of this kind have been devised: as that of Boussingault, by the use of baryta, and depending on the absorption of oxygen at one temperature and its liberation at another; that of St. Claire Deville and Debray, by the decomposition of sulphuric acid by heat into sulphurous acid and oxygen; and that of Tessié du Motay, by the absorption of oxygen from the air by a mixture of oxide of manganese and soda at a high temperature, and its liberation by the action of superheated steam.

This last-named process, of which we gave a full description in the JOURNAL several years ago, appeared more likely than any other to become an industrial process. It will be recollected that it was proposed to apply it to purposes of illumination, using it in conjunction with coal gas by heating a cylinder of magnesia or zirconia, thus forming an improved kind of Drummond light. It was tested on quite an extensive scale in Paris, and its friends were so sanguine of success that they asked permission to pipe the streets of the French capital for the distribution of the gas. In 1869 a commission was appointed by the Prefect of the Seine to make an examination of the new process, and to report upon the expediency of granting this petition. After a series of very careful experiments with oxygen used with ordinary gas and with gas "carburetted" by means of various liquid hydrocarbons, they came to the conclusion that the new light, for a given intensity, was considerably more expensive than the old-fashioned coal gas. They therefore advised that permission to lay down pipes should not be granted, but that the oxygen and carburetted gas should be furnished in portable gasometers to those who wanted it. For certain special purposes, where a very intense light was required, the new process was obviously useful, notwithstanding its cost. It was adopted at the time, in place of the lime and electric lights, in some of the Paris theatres. Whether it is still used we do not know, but in the new Grand Opera House, all the arrangements of which are presumed to be most perfect of their kind, we see that the electric light is employed for stage effects, the battery for the purpose being by far the largest and most powerful ever made, consisting of no less than 360 Bunsen cells.

In Brussels, as we learn from Dr. A. W. Hofmann's interesting "Report on the Development of the Chemical Arts during the last Ten Years," the results obtained were not more favorable. Lighting with oxygen was tested there two years ago, but was soon given up. It was also tried in one of the railway stations in Vienna in 1874, but the process was not represented at the Exhibition, and does not appear to have attracted much attention.

Dr. Hofmann remarks that "should further experience confirm these decisions, the manufacture of oxygen would be deprived of its present foundations; for it has been undertaken solely in the hope of the application of the oxygen for lighting purposes." When Tessié du Motay first brought out his invention, however, he hoped to apply it to bleaching, as well as to lighting, and his bleaching process was exhibited at the Paris Exposition of 1867. It would take too much space to describe the method in detail, but it was claimed at the time that hemp and linen threads were perfectly bleached in one day at a cost of about seven cents per kilogram, and woven stuffs in three days at a cost of a cent and a quarter per metre; while by the ordinary processes the bleaching of the threads required from fifteen to thirty days, at a cost of nine cents per kilogram, and the woven stuffs from thirty to sixty days, at a cost of two cents per metre. But this early promise of the new process does not appear to have been sustained, and nothing is now heard of it. At present the most probable "opening" for oxygen in an industrial way is in certain metallurgical processes, to which we may refer hereafter in another connection.

In medicine, as in the arts, the hope that oxygen might become of important service has not, as yet, been realized. Its therapeutical properties have been the subject of many experiments, but the results have not been such as to satisfy competent judges that it will prove of any great value as a remedial agent. On this subject Pereira, one of the latest and best authorities, remarks: —

"Soon after the discovery of oxygen gas, a strong feeling arose in favor of its medicinal applications. Various diseases, *e. g.*, scurvy, were ascribed to a deficiency of it in the system, and it was accordingly employed in many cases, and, as was at first declared, with brilliant results. In England, it was tried by Beddoes and Hill. The latter declares that he found it useful in asthma, weakness, ulcers, gangrene, white swellings, and scrofulous affections of the bones. These views have been again abandoned, both on chemical and physiological grounds. In asphyxia, from want of air, or from the inspiration of pernicious gases, oxygen gas may be inhaled with advantage. From the same reason, it has been recommended in spasmodic asthma attended with danger of suffocation. Still it is, at the best, a mere palliative, and can by no means prevent renewed attacks. If we consider, in the application of oxygen gas, its physical action, as already discussed, we shall readily conclude that the inspiration of oxygen is in most cases useless, and that but little — and only in few cases — can be expected from its therapeutical application."

It has been suggested that oxygen should be inhaled by those who ascend to great heights in mountain climbing or in ballooning, to counteract the effects of atmospheric rarefaction. P. Bert exposed himself and others, in a suitable apparatus, to air far more attenuated than is found at the greatest altitudes hitherto reached. He states that the difficulty of breathing and the symptoms of suffocation which appeared when the barometer indicated from 10 to 12 inches were relieved by a single inspiration of pure oxygen. It was found more advantageous, however, to dilute the oxygen with atmospheric air. On a balloon voyage which Croce-Spinelli and Sivel made in March, 1874, they took with them mixtures containing 45 and 75 per cent. of oxygen. With the aid of these they were able to conduct physical observations without bodily inconvenience at a height of more than 6000 metres (19,680 feet). It is probable that oxygen may prove of some value in certain exceptional circumstances like these.

It was our intention to refer to the possible industrial and medicinal applications of ozone, which is a modification of oxygen, but the length to which this article has extended forbids. We may resume the subject at a future time.

THE PHYSIOLOGICAL EFFECTS OF THE WATER WE DRINK.

SOME interesting experiments have been made in France by M. Papillon, with a view to test the action of certain phosphates, administered in distilled water, on the bony structure of various animals. These were virtually experiments on artificial drinking-waters, and they prove that mineral matter in dilute solution is capable of being assimilated by the body, the structure of which may thus be materially modified. Indirectly they show that the effect of altering the chemical composition of the water supply of a community may involve questions of great importance to the physical development and health of its members. The very composition of our bones is affected by the quality of the water we drink. If the water contains lime, that substance will be taken up and will appear as phosphate of lime in the bones; if it contains strontia or magnesia, these will appear as phosphates of strontia or magnesia. If the water is deficient in mineral matter, there will be a corresponding deficiency in the constitution of the bones. It is said that such instances have occurred in Holland, in districts where the inhabitants can obtain only rain water for drinking purposes. This fact, probably combined with an absence of lime

in their food, occasions a softening and distortion of the bones of the body. By varying a water supply it might be possible to alter the physical organization of a population; and in future ages, from the examination of the bones of bygone generations, the character of the water they were in the habit of drinking might perhaps be deduced.

Much attention has of late been directed to organic impurities in drinking-water, but those of an inorganic nature have been almost overlooked, although, as was pointed out in a paper read by Mr. W. J. Cooper at the last meeting of the British Association, serious mischief has in many instances resulted from the incautious use of deep spring waters. At Hendon, England, an Artesian well was bored to supply water for some valuable horses which were being reared there. The water was bright-looking, pleasant to the taste, and quite free from any organic impurity; the foals, however, that drank it soon died, and the whole stud were seriously affected with diarrhœa. Professor Way, one of the Royal Commissioners of Water Supply, analyzed the water, and it was found to contain sulphates of magnesia and soda in considerable quantity. On discontinuing the use of the water the disease was arrested. A similar case occurred at Rugby, but in that instance human beings were the sufferers. The water from an Artesian well free from organic impurity was hailed with satisfaction on that account; the community, however, were attacked with diarrhœa caused by the sulphate of magnesia, or Epsom salts, in the water, and the supply had to be discontinued, as there is no known method of freeing water from sulphates.

In the paper to which we have referred above, Mr. Cooper remarks: —

"The opinions of some leading authorities on water supply have undergone considerable modification recently. A few years ago Dr. Frankland returned all solid matters in water as impurities, in the analyses he made. I was therefore much surprised to hear him recommend as a supply to a district containing 14,000 inhabitants a water proved by analysis to contain 12½ grains of anhydrous sulphate of magnesia per gallon, equal to 25 grains per gallon of Epsom salts. This evidence was given last session before a committee of the House of Commons. Dr. Frankland stated that it was absurd to say that a water containing such a quantity of Epsom salts could be objectionable from a dietetic point of view. Fortunately for the health of the people the parliamentary committee refused to allow the district to be supplied with the Epsom salt solution. The water of St. Ann's Well, at Buxton, the slightly purgative quality of which is considered as one of its merits, contains an amount of magnesia equal to 13 grains of Epsom salts per gallon. It is known that goitre and other throat and glandular affections, and even idiocy, have been attributed to inorganic salts in drinking-water. We know that the human system is easily deranged by a change in the drinking-water. The spa and chalybeate waters at the favorite places of resort have been renowned for ages for their medicinal virtues. If the entire organic structures of the human body are liable to alteration when excess of mineral matter is introduced into the system, it is essential that health-seekers at these medicinal springs should place themselves under medical supervision. And one of the first considerations in the inauguration of a water supply should be to insure a perfect freedom from excess of any mineral except those comparatively harmless ingredients, chloride of sodium and carbonate of lime."

In the discussion which followed the reading of this paper, several leading sanitary officers gave the results of their experience, which was almost unanimously in accordance with the views presented. It appeared to be the general opinion that the importance of the subject had not been justly appreciated. It is not enough that water should be free from organic impurities; it must also be free from any mineral contamination that would in course of time act injuriously on those who constantly use it.

SUN-SPOTS AND THE GRAIN MARKET.

The German astronomer Schwabe, who watched the spots on the sun every fair day for about forty years, discovered that they occur with greater frequency at regular intervals of about eleven years. For five years or more they increase in number until they reach a maximum, and then they decrease for a similar period to a minimum. This discovery was followed by another no less remarkable; namely, that the daily variation of the magnetic needle has a period of about eleven years, and the time of greatest variation coincides with the maximum of the sun-spots. It is also found that magnetic storms and the aurora have similar cycles, with maxima occurring at the same time with that of the spots. Our readers doubtless remember the interesting observations of Professor Young, first published in the Journal, showing that sudden outbursts in the solar atmosphere were accompanied by remarkable disturbance of the magnetic needle.

At the late meeting of the British Association at Bristol, Professor Jevons read a paper upon certain less direct and very curious relations between the solar spots and terrestrial events. After alluding to the attempts made by Mr. Carrington to trace a connection between the price of grain and the variation in the sun-spots during portions of the last and the present centuries, he remarked that Mr. Schuster had pointed out that seasons remarkable for good vintages in Europe had occurred at intervals approximating to eleven years, the average length of the principal sun-spot period. The elaborate collection of the prices of commodities in all parts of England between the years 1259 and 1400, published in Professor Rogers's "History of Agriculture and Prices in England," appears to afford the best data for deciding whether the sun-spot period influences the price of corn. For this purpose, tables of the average prices of wheat and other grain, expressed in grains of pure silver, were used. Each series of prices was divided into intervals of eleven years, which were ranged under each other and averaged, so as to give the average of the successive years, the commencement of the period being arbitrarily assumed. It is found that the price of each kind of produce examined rises in the first four years, but afterwards falls. It is further shown that the maximum prices are found to fall into the tenth, eleventh, first, second, and third years of the assumed eleven year period. These results are to be looked upon as only preliminary, and need further investigation. It is also pointed out that commercial panics have tended to recur during the last fifty-four years in a distinctly periodic manner. The average length of interval between the principal panics is about 10.8 years, nearly coinciding with the length of the solar-spot period. If Professor Balfour Stewart is right in holding that the sun-spot variation depends on the configurations of the planets, it would appear that these configurations are the remote cause of the greatest commercial disasters. The modern astronomer thus returns by a new road to the ancient astrologer's belief in the influence of the heavenly bodies upon human affairs.

FAMILIAR SCIENCE NOTES.

Fruit in Prehistoric Times. — Carbonized apples of small size, identical with those growing wild in the woods of Switzerland, have been found abundantly in lake bottoms, and in a tolerable state of preservation. Mr. Messikommer discovered on one occasion more than 300 of them lying close together. They are often cut in halves, more rarely in three or four parts, and were evidently dried for consumption during winter. Whether a larger kind of apple found at Robenhausen was cultivated, or a wild-growing species, remains undecided. Professor Oswald Heer, of Zurich, who has published an interesting work on lacustrine vegetable remains, inclines to the former view. Wild pears were treated in the same manner; but they are far less common than apples, which must have formed a much-sought article of diet. Among other vegetable remains accumulated in the lake mud may be mentioned hazel-nuts and beech-nuts, both in great plenty; also water chestnuts, which doubtless were collected and eaten by the lake-men, as they are in Upper Italy at this day. Their present occurrence in Switzerland appears to be restricted to a tarn in the canton of Lucerne. There have further been found abundantly the stones of sloes, bird cherries, and wild plums, and seeds of the raspberry, blackberry, and strawberry, showing that these fruits of the forest were used as food. According to Dr. Keller, the lake colonists of the Stone Age drew their sustenance chiefly from the vegetable kingdom. Their animal food evidently was acquired by hunting rather than by the breeding of cattle, considering that in the accumulations around the piles the bones of wild animals outnumber those of the domestic species. Milk, we may assume, formed an important article of their diet.

Weather Maxims. — "Old Probabilities" has formulated the results of his observations for New England as follows: —

1. As a rule, if the wind touches northeast or east for two or three days, it is a sure indication of rain.

2. Dense smoke and haze in early morning portend falling weather.

3. Summer showers of light character often follow two or three days of smoke or haze.

4. Fog, frost, and dew precede rain 24 to 48 hours, except fog at close of storm.

5. Wind veering from north or west to south and southeast precedes falling weather.

6. Halos, lunar and solar, also fairly defined and brilliant auroras, precede rain 24 to 60 hours.

7. Barometer rising or falling considerably away from its mean forebodes falling weather, subject to modifying influences of the neighboring ranges of mountains and hills.

8. Precipitation generally follows a rapid influx or efflux of atmosphere.

9. If wind is in southwest and rain sets in, the rain is of short duration and light yield.

10. Banks of watery clouds or heavy haze on south or southeastern horizon indicate rain.

11. An area of low barometer at or near Fort Monroe, and running up the coast, surely reaches here as a northeaster.

Sonorous Flames. — M. Dechorme, in the *Comptes Rendus*, reports some interesting observa-

tions on the production of sounds by blowing through a tube into a flame. He considers that the action of the air is chemical rather than mechanical, and that the sound results from small explosions that are produced incessantly on combination of the oxygen of the air with the hydrogen or carbon of the flame, in incomplete combustion. For the sound to occur, the presence of air, or of an inert gas mixed with the oxygen, seems necessary. In one of his experiments the white flame from a Bunsen burner, with the lateral apertures closed, gave a very strong sound when blown into with a tube, whereas the blue flame produced when the apertures are open gave a very weak one, or none at all. Carbonic acid alone, or nitrogen, or oxygen, or chlorine, blown into a flame of ordinary gas, gave little or no sound; protoxide of nitrogen gave a sound that was weak, but more acute than that obtained from air.

HINTS FOR EXPERIMENTERS.

Electrical Experiments. — The *Telegraphic Journal* (London) says that Terquem proposes the following experiments to prove that electric charge remains on the surface of bodies: He takes a bird-cage and suspends it from the prime conductor. He places inside a gold-leaf electroscope, pieces of tinsel, feathers, pith balls; nothing stirs. He suspends inside and out bundles of threads; those inside are unaffected, those outside are affected. Bands of paper outside are excited, others inside are not affected. He also introduces a bird, which is quite undisturbed.

Faraday showed the polarity of electrified materials by filling a glass trough with oil of turpentine, and inserting in it small fragments of *white silk*. When discharges passed, the fragments formed a connected chain, which ceased with the discharges. Matteucci used various powders, which always formed a linear series.

In a properly constructed electrometer no external influence should exercise any effect upon the movable conductors. In present instruments the inner surface of glass is liable to become electrified, and does so. Faraday showed that this could be obviated by coating the interior of the glass case with a fine net-work of tin-foil. A cage of fine wire inside the glass shade will have the same effect.

To Fix Magnetic Curves. — The following neat methods of fixing the beautiful curves made by iron filings on paper, under the influence of a magnet, are from an interesting article in the *Electrical News* describing the practical instruction in electricity and magnetism at the South Kensington Science Schools: —

(*a.*) Make a solution of gall nuts. Brush over sheet of paper with solution; remove superfluous moisture by blotting-paper. Place damp paper over curves, press evenly, carefully lift paper; dry quickly, and shake off filings. A permanent impression in ink will be left on the paper. (*b.*) Fix pair of magnets to one side of square of glass, coat other side with very thin gum water; when plate is quite dry, dust fine iron filings over gummed surface, tap, then breathe gently on plate. Gum is thereby softened and curves fixed.

The Burning of Oxygen and Hydrogen. — M. Neyreneuf describes two methods of showing the vibratory motion attending the explosion of a mixture of oxygen and hydrogen in a cylindrical tube: first, by using tubes carefully dried; and secondly, by covering the interior with paraffine. In the first case the steam condensing on the colder parts leaves transparent the parts which the flame in vibrating has more strongly heated. The latter are, on the other hand, shown in the second case by the melting of the paraffine. It is indispensable that the combustion shall not be too rapid; and further, to obtain the best effects the proportion of the mixture should be varied with the dimensions of the tube. With a tube one and a quarter inches in diameter and about eight inches long, containing one part of hydrogen and one of air, lines appear resembling fern leaves. With tubes of less diameter the effects are more regular, especially if a musical sound is produced by the explosion. Fine striæ are then observed perpendicular to the axis of the tube. When the tube is very long, there is only a confused sound, but the striæ are well separated and sharply defined. If the mixture is ignited by the eudiometric method, these appearances are no longer produced. If the tubes open at both ends, the effect is the same as if one end is closed. With a long tube the appearance in the dark is the same as that of a Geissler tube illuminated by a single motion of the breakpiece.

HOUSEHOLD MEMORANDA.

Breakfast Dishes. — In an article under this heading the London *Agricultural Gazette* says: —

"In discoursing of breakfast dishes, foremost on the list stands 'Scotia's halesome fare,' the porridge bowl, with its accompaniment of sweet milk, or, as some prefer it, of buttermilk, or of the two mixed; for Sir Walter Scott, an authority on such matters, tells us, in 'Waverley,' that while the breakfast-table of the Baron Bradwardine was 'loaded with warm bread, together with eggs, reindeer ham, mutton and beef ditto, smoked salmon, marmalade, and all other delicacies, which induced even Johnson himself to extol the luxury of a Scotch breakfast above that of all other countries, a mess of oatmeal porridge, flanked by a silver jug, which held an equal mixture of cream and buttermilk, was placed for the baron's share of the repast.' Bilious subjects, who cannot stand the richness of the unchurned milk, will find the baron's admixture a useful corrective.

"Porridge, to be easily digestible, should be made rather thin, and boiled for at least half an hour; the gelatinous properties of the oatmeal will thus be brought out, as will be seen by the mixture, on being dished up, flowing from the pan in a liquid state, and on cooling acquiring the consistency of jelly. Made thus, it is one of the most nutritious and digestible of foods, nourishing, say the savants, not only the body but the brain.

"A good breakfast dish, that is too little known, is called 'Kegeree,' and is made thus: Take some cold fish, and with two forks flake it off in small pieces, melt a bit of butter in a stewpan, and toss the fish in it till thoroughly warm. Have ready a cupful of boiled rice and two soft-boiled eggs; add them to the fish, season to taste, give one turn over the fire, and serve. This was a favorite dish among the monks of old, and has lost none of the savor those cunning gastronomers detected in it."

To Preserve a Bouquet. — The *American Artisan* says: "When you receive a bouquet, sprinkle it with fresh water; then put it into a vessel containing some soap-suds, which nourish the roots and keep the flowers as good as new. Take the bouquet out of the suds every morning, and lay it sideways in fresh water, the stock entering first into the water. Keep it there a minute or two, then take it out and sprinkle the flowers lightly by the hand with pure water. Replace the bouquet in soap-suds, and the flowers will bloom as fresh as when gathered. The soap-suds need to be changed every third day. By observing these rules, a bouquet may be kept bright and beautiful for at least one month, and will last longer in a very passable state; but the attention to the fair but frail creatures, as directed above, must be strictly observed, or 'the last rose of summer' will not be 'left blooming alone,' but will perish."

A Refreshing Beverage. — The following is an English recipe: Cut two lemons (or any fruit in season) into thin slices; pour on them six quarts of boiling water; add 1 lb. raw sugar, and when very nearly cold a tablespoonful of brewer's yeast. Let it stand twenty-four hours, and then bottle and cork securely, tying the corks down. Honey may be used in place of fruit and sugar; a small quantity of cream of tartar or bruised ginger may be added, if desired, for a change. This is a bright, sparkling, and refreshing drink, pleasant at all times, and has taken the place of all other beverages in many English families.

BREVITIES AND LEVITIES.

A Dog Story. — A correspondent of *Land and Water* vouches for the following: "A Radnorshire lady, who was married in March and came to reside in Yorkshire, recently paid a visit to her father, who, before she was married, had kept two or three sheep-dogs, of which she was very fond. Since then he has retired from business, and disposed of all but one dog. This one met the lady with demonstrations of great delight upon her arrival at her father's house, and that night the dog went a distance of seven miles to a farmhouse where one of the other dogs had been sent (the latter was blind, but kept as being an old favorite). In the morning, when the lady went to the door, she saw not only the dog which had given her such a glad reception the day previously, but also the old blind one, which had evidently been brought by the other dog to welcome her. When the second night came the old blind one was taken back to its home by the same dog, which afterwards returned, having travelled a distance of twenty-eight miles to give pleasure to the old blind one."

The Telegraph and the Mouse. — A singular occurrence on the Stock Reporting Telegraph lines, at Montreal, is thus related by *The Telegrapher*: "The galvanometer used would vary so much that it was necessary to take out or put in at times 500 ohms resistance to steady it. There is about 3000 rheostat resistance in the line. A peculiar smell was also observed, which became so strong that the operator could scarcely stand it. Upon an examination being made, under the transmitting table the remains of a *mouse*, which had got in between the two battery thumb-screws, was discovered burned to a cinder. It is rather singular that during the whole time only one or two of the instruments were seriously affected. It is not known how long the mouse was thus caught, but it must have been for some time, to have been so thoroughly cremated by the battery current."

"Perpetual Motion" Cheap. — The following advertisement recently appeared in the London *Times*: "Perpetual Motion. No mechanism of any sort; extremely simple. Any light machinery can be kept in perpetual motion. £150 required, for which share will be given, which will realize a fortune. Upon reference being furnished a section of model will be shown, and every information given." The *English Mechanic*, after quoting the advertisement, remarks: "We have no doubt that the invention is extremely simple, but not so simple as any one who will give £150 for it."

Milk for Babes. — The following bits of scientific intelligence are *not* from the "Primer of Chemistry," but from the "Berichte der Deutschen Chemischen Gesellschaft zu Berlin:" According to P. Ebell, when benzoylnaphtylamide is treated with nitric acid, two isomeric mononitrobenzoylnaphtylamides are formed. By the action of hydrogen upon these bodies different products are obtained. One yields monoamidobenzonaphtylamide, the other anhydrobenzodiamidonaphtalene. F. Meinecke finds that when bromine is allowed to act on benzaanilide, monobrombenzanilide is produced; and that the latter when treated with fuming nitric acid yields monobrommononitrobenzanilide and also bromdinitrobenzanilide.

Practical Chemistry and the Arts.

MADDER.

MAN, in his search after the beautiful or ornamental, has seized upon every substance that would aid him in attaining his object. Nothing illustrates this more fully than the history of dyes and dye-stuffs; and from the days of the royal Tyrian purple to the discovery of the latest shade of evanescent aniline, the animal, vegetable, and mineral kingdoms have been ransacked to find shades more delicate or brilliant, or dyes more permanent.

Among the finest, most fixed, and most brilliant colors, those derived from madder by the aid of various mordants must always hold a first rank. Madder is the root of a plant belonging to the natural family called Rubiaceæ, an order of plants that furnishes man with many valuable substances. To it belong both the cinchona and the coffee tree. Ipecacuanha is derived from the root of a plant of this order.

The beautiful red color called Turkey red has been known for a long time, and the secret of its production was zealously guarded by the Turks and Persians, and even now each dyer thinks he has the means of producing a more beautiful and permanent red than any of his neighbors. It was found out at last, however, that this color was produced by means of a plant growing in Turkey, and gradually the whole process was discovered.

This plant, which we now call madder, but which is known in France as *garance*, was soon imported into Europe, and thousands of acres are now devoted to its culture in Holland, France, and Germany. The German province of Alsace is the headquarters of its culture and use, although that grown near Avignon is considered of the best quality. The plant requires two or more years to come to perfection, so as to yield the maximum amount of coloring matter. It is a singular fact that its value as a tinctorial agent depends to a considerable extent on the nature of the soil in which it grows, that growing on a soil containing a large amount of calcic carbonate being much more valuable than that grown on soils wanting in this ingredient.

Madder, when applied directly to cotton cloth which has not had any previous preparation, stains it of a dirty brownish red, but this color is easily washed out by soap and water, leaving the cloth as white as before. To produce the beautiful fast colors known as madder colors requires considerable preparation. The cloth must first be mordanted, as it is called; that is, some substance must be attached to the fibres that is capable of combining with the coloring materials contained in madder. Iron, in the form of sesquioxide, and alumina are such substances. If a piece of cloth is dipped into a solution of acetate of iron or alumina, and then dried, the acetic acid is given off and the alumina or iron oxide remains adhering to the fibre of the cloth. Instead of dipping the cloth into the solution, the solution may be made into a kind of thick paste and printed on the cloth with a roller. This is, in fact, the way it is generally done; and instead of printing on a single substance, sometimes as many as twenty are printed on at once, by the employment of twenty rollers working against a large central one; but generally only three or four are used. The cloth must be specially prepared by long and tedious processes before printing, and after printing it must again be dried, washed, and submitted to other operations in order to fit it for dyeing. It is then boiled with a strong decoction of madder. This decoction must be strong, or rather contain a large amount of ground root, since the root contains only a small percentage of coloring matter. The cloth emerges from the dye-vat looking anything but brilliant. When the iron mordant is applied it is colored of a violet shade, varying in depth from almost black to a light violet or lilac, according to the strength of the mordant. When the alumina is printed on, it is of dull brick red if the mordant was strong; if weak, it is of a rose pink; but all the colors are dull and lack lustre, and the whites are stained of a dirty red. A good washing helps it somewhat, and washing with a solution of bichloride of tin helps it still more; this last also helps to fix the colors. But to bring them out in their full brilliancy, the cloth is boiled with weak soap-water; this clears the whites, converts the brick reds into bright reds and improves the looks of the violets, while at the same time it weakens all the colors more or less. If the whites are still dull, the cloth is then bleached with chloride of lime and again washed; so that the calico since it left the loom has undergone fifteen or twenty distinct operations, and yet the cost of all these, including the cost of the colors used, does not exceed one or two cents a yard.

About fifty years ago when calicoes began to be in much greater demand than they had been, the use of the crude madder was felt to be a serious inconvenience. It seemed as if chemists should devise some means of extracting the small percentage of useful material from the large amount of matter that is totally inert, useless, and even harmful. So the Industrial Society of Mulhouse offered prizes for the best essay on madder, and for the best means of overcoming the difficulties pointed out. They obtained numerous responses, but none that were entirely satisfactory or that overcame all the difficulties without impairing the colors. One method used was to macerate the root with cold water. It was found that nearly fifty per cent. was soluble in cold water, while the coloring matter remained insoluble. The residue was then dried, and formed what is known as "flowers of madder." Another method is to treat the "flowers of madder" with strong sulphuric acid, which destroys much of the woody matter. The whole is then washed, the color still remaining insoluble, and the residue is found in commerce under the name of garancine. This garancine when treated with superheated steam gives another product that is known as pincoffin. But these are all crude products, and the best of them is only three or four times as strong as the crude madder.

Investigations commenced in 1826 and carried on for many years by various persons resulted in showing that madder contained several distinct coloring matters; just how many no two investigators seem to agree upon. The principal of these, and indeed the only ones of any value, are alizarine, purpurine, and purpurine hydrate; another one, called pseudo-purpurine, is also found, but it has no direct value as a dye-stuff. In the root all these substances seem to be combined with a kind of sugar, forming what are known as glucosides. These glucosides are decomposed by the various operations through which the root passes in being prepared for the dye-vat. When alizarine was first discovered, it was thought to be the dye *par excellence* of madder, and many means have been devised of separating it; but it was soon found that while alizarine would give good violets, it would not give Turkey red, and that to produce this color in all its beauty, recourse must still be had to the root itself. But crude alizarine was prepared by various means and found its uses in the dye-house.

Alizarine was purified and obtained in beautiful crystals. These were analyzed, and then chemists set themselves to the task of producing this substance artificially, but with very little success up to the year 1866, as they were working in the wrong direction. From the analysis, the formula $C_{10}H_6O_3$ had been deduced. Now naphthalin has the formula $C_{10}H_8$, and experiments showed that some of the products of the decomposition of alizarine and naphthalin were identical. Many experiments were therefore made in order to convert naphthalin into alizarine, as naphthalin at that time was a refuse product produced from coal tar. None of these were successful, however, although some of the experiments resulted in producing some very handsome dye-stuffs, but they were not alizarine.

The analyses of alizarine agree equally well with the formula $C_{14}H_8O_4$. Two chemists by the name of Graebe, and Lieberman, on experimenting with alizarine and deoxidizing it by means of zinc dust, found that a hydrocarbon containing $C_{14}H_{10}$, and known by the name of anthracene, was produced. They came to the conclusion that alizarine, was not to be derived from naphthalin but from anthracene. Anthracene is another hydrocarbon found in coal tar. So they took anthracene and tried to oxidize it. They found that in the first place they could take out two of the hydrogen atoms and put in their place two oxygen atoms, forming a body that they called anthraquinone. This anthraquinone combined with two more oxygen atoms to form alizarine and the problem was solved. This artificial alizarine had the same properties as the natural alizarine found in the root of the madder. Other chemists then turned their attention to the production of purpurine; the road having been once pointed out was comparatively easy. Purpurine differs from alizarine only in containing one more atom of oxygen, the formula being $C_{14}H_8O_5$. Recent experiments have shown that with a mixture of alizarine and purpurine any shade may be got that can be obtained with the madder itself. Much of the artificial alizarine now manufactured contains purpurine also, and serves to dye Turkey red. As an illustration of the importance to which the business has grown, it may be stated that in 1874 one manufactory alone, in Germany, made 5000 kilograms per day, and there were several others that made very large amounts.

S.

FREE CARBONIC ACID IN WATER.

CARBONIC acid gas is soluble in water, under atmospheric pressure, only to the extent of one volume of gas in one of water. By increasing the pressure, however, the water may be made to dissolve a quantity of this gas proportional to the pressure. This property enables the manufacturers of mineral water and the so-called soda water to prepare solutions which contain a large amount of carbonic acid gas and form a pleasant, sparkling drink. Nature too has the power of impregnating natural waters with so much carbonic acid as to form sparkling springs wherever it comes to the surface. Such water possesses extraordinary solvent powers, and if in its subterranean course it chances to meet with any limestone, it dissolves so much of that as to be known as a lime water, or "hard water," — a terror to owners of steam boilers. Carbonic acid water is capable of dissolving not only marble, but even iron, and hence we find chalybeate springs at Saratoga and in other places.

Whence do natural spring waters obtain their carbonic acid? This is an interesting question, and one about which there seems to be some disagreement. Dr. Von Pettenkofer, in a paper read before the Bavarian Academy of Science, suggests the following rather unpleasant origin of this gas, whose presence in water had been generally considered so desirable:

"I have proved that carbonic acid is not formed in the water which is in the earth, nor obtained by it from gas springs where it escapes from lower strata, but that it comes from the subterranean air, which is in contact with the water, and where it can be generated only by the decomposition of organic matter. Hence, from a hygienic point of view, of the waters about Munich and in all limestone coun-

tries, those which contain the most carbonic acid are seldom the best and purest, because we must take in the bargain along with the carbonic acid many other substances which we would otherwise gladly avoid."

The presence of free or uncombined carbonic acid in spring-water in a limestone region is quite uncommon (unless it be derived from subterranean gas springs), for the reason above stated, that it dissolves the carbonate of lime, or chalk, forming with it the soluble bicarbonate of lime.

To ascertain whether a given sample of water contains any free carbonic acid, or whether all the acid exists in combination with lime, two methods are given by Pettenkofer. The first consists in the use of turmeric paper along with lime-water. Water containing bicarbonate of lime is without action on turmeric; hence, if a few drops of lime-water be added to water containing free carbonic acid, a bicarbonate will be formed and the turmeric will not be browned until an excess of lime-water has been added over and above what is required to combine with all the free carbonic acid. If the water to be tested contains no free carbonic acid, a single drop of lime-water will render it alkaline, and the turmeric paper will be browned. The second and more recently discovered method is, however, preferred by Pettenkofer, but unfortunately the reagent is neither so well known nor so easily prepared. It is rosolic acid, prepared by Kolbe's process, namely, the action of sulphuric acid on phenol and oxalic acid. This acid is colored red by the bicarbonates of the alkalies and alkaline earths. To prepare the test solution, dissolve one part of pure rosolic acid in 500 parts of 85 per cent. alcohol, and neutralize with caustic baryta until it begins to redden. Add about ½ cubic centimetre of this solution to 50 c. c. of water; if the liquid becomes colorless or yellowish, it contains free carbonic acid; if red, only bicarbonates are present. In tests made by Pettenkofer on German waters he reports that all the spring and well waters of Munich, the waters of the Isar, the water of Stadtbäche, and some drinking-water from Würzburg gave the red color indicating bicarbonates. Distilled water, rain, and snow-water, of course, were not reddened. Of those which remained colorless he mentioned Selters, Apollonaris, Wildunger, Kissingen, Ragoczy, Weilbach sulphur water, Pyrmont iron water, etc. H.

MEMORANDA IN THE ARTS.

A Darning Machine. — Knitting machines have become familiar household articles, and now a Boston man has supplemented them with a darning machine, which was exhibited at the late fair of the American Institute in New York, and is thus described in the *Scientific American:* "Two small plates, one stationary and the other movable, are placed one above the other. The faces are corrugated, and between them the 'holy' portion of the stocking is laid. Twelve long-eyed pointed needles are arranged side by side in a frame, which last is carried forward so that the needles penetrate opposite edges of the hole, passing in the corrugations between the plates. Hinged just in front of the plates is an upright bar, and on this is a cross-piece carrying twelve knobs. The yarn is secured to an end knob, and then, with a bit of flat wire, pushed through the needle eyes. Then the loop between each two needles is caught by the hand and hooked over the opposite knob, so that each needle carries really two threads. Now the needles are carried back to their first position, and, in so doing, they draw the threads, which slip off the knobs through the edges of the fabric. A little push forward again brings the sharp rear edges of the needle eye against the threads, cutting all at once. This is repeated until the darn is finished, and beautifully finished it is. The cost of the machine is but ten dollars."

A Week's Work at Birmingham. — According to the London *Engineer*, a week's work in Birmingham comprises among its various results the manufacture of 14,000,000 pens, 6000 bedsteads, 7000 guns, 300,000,000 cut nails, 100,000,000 buttons, 1000 saddles, 5,000,000 copper or bronze coins, 20,000 pairs of spectacles, six tons of papier-mâché wares, over £30,000 worth of jewelry, 4000 miles of iron and steel wire, ten tons of pins, five tons of hair-pins and hooks and eyes, 130,000 gross of wood screws, 500 tons of nuts and screw bolts and spikes, 50 tons of wrought-iron hinges, 350 miles' length of wax for vestas (wax matches), 40 tons of refined metal, 40 tons of German silver, 100 dozen of fenders, 3500 bellows, 800 tons of brass and copper wares, — these, with a multitude of other articles, which are exported to almost all parts of the globe.

Safety Lamp. — An improvement in safety lamps has been devised by M. Boullenot, of Paris. It consists in replacing the safety lamps usually employed in mines containing fire-damp by lamps supplied with air from outside the mine. Fixed pipes are carried down the mine, and branches are led into all the workings. Through these compressed air is forced from the surface by air-pumps, and the improved lamps are screwed to the air-pipes by couplings with stop-cocks. The cylinder inclosing the flame is protected by a cage, and the products of combustion pass off through two pieces of wire-gauze. The match for lighting the lamp is inserted through a spring clip, ignited within the lamp, and cannot be withdrawn until extinguished.

Narrow Gauge Railway in Switzerland. — Besides the two rack railways up the Rigi, a narrow gauge road has been opened from Kaltbad to the point on the mountain known as the Rigi-Scheideck. This road is 4 miles long, and a metre (39 inches) broad, with a grade of 1 in 20. Kaltbad is 4728 feet above the sea, and the Rigi-Scheideck is 5406 feet. This is therefore the highest railway of the ordinary construction in Europe. Like the other Rigi railways it is open only from May to October, or about half the year.

PRACTICAL RECIPES.

Gold Powder. — The *Revue Hebdomadaire de Chimie* gives the two following processes for preparing this article: *M. Robert's Method.* — Put some gold-leaf in a saucer; add thereto a little honey; pound well together with a glass stopper, the base of which presents a flat, smooth surface; throw the paste thus obtained into a glass of water containing a small quantity of proof-spirit, wash it, and leave it therein. Decant the liquor and again wash the precipitate, repeating the operation until a very fine, pure, lustrous gold powder is obtained. Mixed with sea-salt and cream of tartar powdered and diluted with water, this powder can be used for gilding.

M. Boutil de Monrel's Method. — In a sufficient quantity of aqua regia, put in a porcelain capsule and heated in a sand bath, dissolve 1 gram of fine leaf gold; reduce it until it has the color of bullock's blood. Add a half-litre of hot distilled water, in which 4 grams of potassic cyanide have been dissolved. Stir well with a glass rod and filter through blotting-paper on a glass funnel. The potassic cyanide must be dissolved beforehand. The gilding process consists in cleaning the objects thoroughly, and placing them on a piece of clean zinc in a bath of gold prepared as above and gently warmed, where they are left for the space of ten minutes or more, according to the thickness of the gilding desired.

To Preserve Fence Posts. — According to excellent authority, fence posts can be made as imperishable as iron for less than two cents apiece. Pulverized charcoal is to be stirred into boiled linseed oil to the consistency of paint, and a coat of this is to be brushed over the part of the post to be placed in the ground.

Agriculture.

INJURY TO LAWNS.

During the past summer, great injury to lawns in the vicinity of this city has resulted from the attack of worms upon the tender grass roots. The fine lawn of Alvin Adams, Esq., of Watertown, has suffered greatly; also the lawn at Woodlawn Cemetery, and many others. The worm, burrowing beneath the sod about three inches, makes a clean horizontal cutting, so that the sward can be lifted up like a carpet. The worm is white, about two inches long, and one quarter of an inch in diameter. This worm is unfortunately not the only enemy to lawns. In some places large colonies of ants, of several kinds, have appeared upon lawns this summer, and in a few weeks totally destroyed them.

This is discouraging, truly, but it is well to remember that everything beautiful or useful coming from or connected with the soil, whether fruits, flowers, shrubs, or grasses, is produced and maintained only by a persistent contest with destructive agencies; and when a new enemy appears we have only to set about devising effective means to meet him. How shall we save our lawns? We are inclined to think that preventive measures must first be regarded. Upon many lawns large quantities of stable manure or animal excrement are used. In order to secure a peculiar and permanent luxuriance of grass, the soil to a considerable depth is thoroughly filled with animal manures, and this invites the worms and perhaps the ants. The worms thrive best in a rich soil, or in one largely impregnated with excrementitious substances. Farmers cultivating poor, worn-out lands, are seldom troubled with enemies beneath the soil. We know the rich grasses will thrive only where the best nutriment is supplied in abundant quantity, and hence if we do not fertilize we can have no lawns. True; but we are not restricted to one source of supply or one form of plant food. We can ignore excrementitious manures altogether, and yet have fine lawns. We have not for several years used stable or farm-yard manures upon lawns, but the concentrated or mineral fertilizers, which have given most satisfactory results. A lawn properly prepared should always receive a coating of gypsum, for this agent is the peculiar pabulum of the white clover plant, one of the richest, densest, and most beautiful of our lawn grasses. It is so sparingly soluble in water that a coating will last for many years, and furnish sufficient nutriment. Nitrate of soda also, or better, if one can afford it, nitrate of potash, is an excellent fertilizer for lawns. Combine with these true superphosphate of lime and the "animal dust" of the abattoirs, and you have everything necessary to grow the most luxuriant grasses, and nothing is furnished that worms or insects can use as food.

It is a bad practice to spread a coating of stable dung over a lawn in the autumn, as the seeds of vicious weeds are washed out, and, lodging in the soil, fructify, and ultimately crowd out the desirable grasses. Lawns should be fed several times during every season; and if the fertilizing agent can be presented in liquid form, all the better. Weak solutions of the nitrate of soda or potassa are easily made, and the "animal dust" and superphosphate may be applied

in fine powder *during* a rain. We say *during* a rain, because one does not know when rain will fall, and from directing to apply just *before* a rain grave mistakes may result. An old rubber coat and hat will protect workmen from showers, and enable them to work freely. We are confident that avoiding the use of animal manures will suffice to rid us of the worms and insects that threaten to devastate our lawns.

DIGGING ROCKS.

The post-tertiary epoch, about which geologists talk so glibly, was an evil epoch to us. It is true we have utilized about thirty thousand cubic feet of the boulders brought to us in that age, in house building; but if the great glaciers had transported over the borders of New Hampshire and Maine somewhat lighter burdens, there would have been saved a large amount of "back-ache" in men and beasts. This perpetual digging of rocks has ceased to be a pastime at the farm; it is, as Mike remarks, a "serious, heavy business."

It was Mr. Beecher who once said that his respect for the Almighty power had wonderfully increased since he attempted to form a small hill on his farm with the spade and shovel. And so the lifting of rocks tends to produce a supreme awe for the divine force which put together the rocky framework of the globe and lifted out of it the huge mountain masses. But our reverence turns not alone in one direction; it is impossible not to think of our sturdy forefathers, while digging out of their beds the massive boulders. They began the work on our New England farms; indeed, they spent their lives among rocks, and died, so to speak, with pick and crowbar in their hands. We are only removing the rocks they left, and yet how numerous and heavy they are. Lakeside Farm was not what was called "rocky land" before it came under our care. Corn, potatoes, grain, and the grasses grew in fair quantity under former owners' methods of husbandry; but since it fell to us we have lifted and carted away from the hills and meadow at least one hundred and fifty thousand cubic feet of stone of all sizes and forms. The hill on which Winnekeni Hall stands is undoubtedly an ancient *moraine*, and there is evidence leading us to believe it to have been a *terminal* moraine. Hence, the melting ice piled up at this point a vast heap of sand, gravel, clay, and boulder rocks, on top of which there remains, fortunately, a rich, deep loam. The rocks are all worn by attrition, and many carry on their faces the grooves and scars caused by grinding over other rocks in their passage from the north. It is probable these rocky fragments have come to us from distances of twenty, thirty, fifty, and even two hundred miles. We never take one of them in our hands without mentally interrogating it as to its origin, home, and *how long* it was on its travels from the parent rock. Oh, that some of these rocks had tongues! What a story of chaos, cold, river torrents, cataracts, and whirlpools of ice-cold water could they tell us, the experience of only their comparatively later history.

To remove rocks thoroughly from a field, the subsoil plough must be used. The under subsoil deposits must go, if we wish to place land in the best possible condition. In subsoiling about an acre of land, a field from which we had previously removed two crops of rock, six men and a stout team were employed, and the rocky product completely covered the ground. This treatment, although expensive, is necessary to protect from drought, and give grass and grain roots ample space for forage.

GERMAN AGRICULTURAL EXPERIMENTS.

A writer in the London *Agricultural Gazette* gives an interesting description of a recent visit to several of the most important agricultural stations of Germany. These are government institutions, and are probably the best in the world of their class. They are about forty in number, some being *Versuchs-stationen*, or establishments for investigation and analysis, while others are academies or colleges, in which the teaching of scientific agriculture is the main object.

Many of the *Versuchs-stationen* limit their work to a special subject. The station at Wiesbaden, for example, is devoted to the subject of wine; that at Kuhthurm, and several others, to animal chemistry; and so on. This concentration of study is of course attended with many advantages. The Germans consider that agricultural chemistry is becoming so vast a subject that it must be subdivided into three branches, the soil, the plant, and the animal, and that chemists should confine their attention to one of these divisions.

In studying the development of plants "water-culture" is a purely German method of investigation, and has been brought by them to great perfection. The writer to whom we have referred gives the following account of it: —

The seedling plant is supported over the mouth of a large jar containing water, into which the roots of the plant dip; the water is supplied with the potash, lime, phosphates, nitrates, and other essential ingredients of plant food. This solution of plant food is excessively dilute, containing but 1 part of solid matter in 1000; it is renewed from time to time. The roots of the plant are protected from light. Under these conditions many plants have been grown to great perfection. We were too late in our visit to see plants in a state of growth, but the oat plants harvested this season at Hohenheim were shown us; they were of considerable size and vigor.

By means of water-culture a number of questions concerning the nutrition of plants have been successfully solved. Among the more striking results may be mentioned the fact that silica, which forms so large a part of the ash of cereals, is really unessential to their growth, and that maize or oats with a perfectly stiff straw may be grown without any silica being supplied. On the other hand, the very small quantity of iron present in plants has been shown to be essential, and in its absence growth soon comes to an end.

At the Physiological Station at Kuhthurm the writer saw one of the famous "respiration chambers," of which there are now four in Germany. He describes it as follows: —

Here, again, we have a method of research peculiar to German investigators, and which has yielded a rich harvest of results. We were fortunate enough to see the chamber in action. It is built of iron, with glass windows, and when closed is perfectly air-tight. The apparatus connected with the chamber admits of air being slowly drawn through it, the air as it leaves the chamber being measured, and the amount of water, carbonic acid, and other gases present in the air being determined. As the composition of the air which enters the chamber can equally be ascertained, all the data necessary for an exact experiment are obtainable. In this respiration chamber the animal to be experimented on is placed, receiving at the same time a diet of known composition. Everything that the animal takes into its system in the form of food is known, and everything that leaves the animal as excrement, or by perspiration or respiration, is also known; by difference, therefore, the constituents retained in the body of the animal can be ascertained. By this painstaking and thorough method of investigation many important facts have been brought to light. Thus, it has been shown that fat is formed in the animal from the albuminoids contained in the food, while in the older view of nutrition it was supposed that fat was exclusively formed from sugar, starch, and other carbohydrates. Another fact established is that oxygen is stored up in the system during sleep, and re-evolved as carbonic acid during waking hours.

GLEANINGS IN FOREIGN FIELDS.

The King of the Pumpkins. — A recent number of the London *Garden* says: "Last week took place that ceremony of the Paris autumn markets, the 'crowning of the pumpkin.' The custom is not believed to be very ancient, though it dates, say the learned, from the year One. All market gardeners, who own a fruit of extraordinary size, send in their claim. A decision is made after long comparison and much study. The very biggest and fairest of all pumpkins competing is picked out, is adorned with a paper crown, and is raised upon a beautiful gilt board hung with ribbons, and adorned with little flags. Four giants, chosen among the porters of the Halles, and suitably attired, carry it all round the market. Every stall-keeper is bound to rise and do obeisance. Flowers and vegetables are cast before the king. Two noteworthy market-women present an address, and there is abundance of innocent foolery. It is the great day of the Halles, and every one does his best to make the crowning a success. Then the king is very solemnly sacrificed, and his members are put up to auction. It is the proper thing amongst his subjects to have a fragment of his Majesty in the soup that night."

Flowers versus Flies. — The Rev. George Meares Drought, writing from Ireland to the London *Times*, says: "For three years I have lived in a town, and during that time my sitting-room has been free from flies, three or four only walking about my breakfast-table, while all my neighbors' rooms were crowded. I often congratulated myself on my escape, but never knew the reason of it until two days ago. I then had occasion to move my goods to another house, while I remained for two days longer. Among the things moved were two boxes of geraniums and calceolarias, which stood in my window, the windows being always open to the full extent, top and bottom. The boxes were not gone half an hour before my room was as full of flies as those around me. This, to me, is a new discovery, and perhaps it may serve to encourage others in that which is always a source of pleasure, and which now proves also to be a source of comfort, namely, window gardening."

A Big Lump of Condensed Milk. — A sample of condensed milk weighing about 112 pounds was lately exhibited at the rooms of the Society of Arts in London, and an interesting experiment made thereon. This mammoth piece of solidified fluid was prepared by Hooker's process. It has been exposed to the action of the air for four years and three months, yet its quality was so excellent that in a few minutes it was resolved, by churning, into good fresh butter. This trial was only one of a series made at the International Exhibition, South Kensington, and elsewhere. In each case the same satisfactory result was obtained.

Viniculture in Wales. — A London journal

says: "The Marquis of Bute is stated to be trying a curious experiment near Cardiff. He has had planted some 3000 vines on a sunny slope on his estate, and means to try if wine can be made in Wales. He has already had some wine made from grapes trained against walls, and has even contrived to drink some of it. One hopes that Lord Bute's wine may not resemble the *vin de Suresnes*, of which it is said that it takes three men to drink it — one to hold the victim while the other pours the wine down his throat."

AMERICAN NOTES.

What a Western Woman did in a Day. — "A Farmer's Wife," of Dwight, Illinois, sends to an exchange an account of a day's work, of which the following is a summary: Rose at 4.30, skimmed the milk, fed the chickens (has 33 young ones and 150 eggs nearly ready to hatch), got breakfast, which was eaten at 6 o'clock. Her sister was to drop corn from the planter, and it was arranged that the wife should go to the field at ten o'clock, while the sister returned to the house to mind the baby. So the baby was dressed, the dishes washed, the beds made, the floor mopped, the setting hens fed, chickens killed and prepared for dinner, cookies baked, the baby put to sleep, and the dinner arranged by ten o'clock, when the wife took the lunch and went to the field to relieve her sister. After dinner there was the usual routine-work to do, after which watering plants and other garden work occupied her until three o'clock; then she went to the field and dropped corn until night. After supper she milked, fed the chickens, baked bread, ironed, sewed buttons on the husband's shirts, watered the house-plants, crimped the ruffles on baby's Sunday frock and the lace on her own best dress, besides other things not enumerated here — forgetting nothing that should have been done except patching the hole in a mitten. If the husband has anything like the energy of the wife, there is wealth in store for that couple, which, it is to be hoped, the baby will inherit.

A California Rose. — The *Santa Barbara Press* says: "Less than a year ago, Dr. L. N. Dimmick placed in his grounds a rose plant, the King of Noisettes, Maréchal Niel. This has extended over a trellis arching one of his garden walks. Within the last six days, a shoot some three feet in length has grown from the foot of this trellis. On this stalk, surrounded by half a dozen vigorous buds, hangs to-day the champion rose of the world in size and perfection. The Maréchal Niel is a cupped variety of rose, having a lemon tint, and with a delicate and delightful perfume. This rose is 16¾ inches in circumference; its shorter diameter five inches. The measurement in various directions from tip to top of petals is over six inches! The depth of the rose is fully three inches. This, we claim, is the largest rose on record. Another marvellous thing we noted before leaving the grounds of Dr. Dimmick, — 113 buds on a rose truss of the La Marque variety. A common felt hat covered the space in which we counted the above number of buds."

Large Tobacco Leaves. — The editor of the *Maryland Farmer* describes some remarkable tobacco which he saw this summer in the garden of Rev. Dr. Tyng, at Irvington, N. Y. One leaf was accurately measured by a gentleman in the presence of several other parties, and it measured 6 *feet* 1 *inch in length and* 4 *feet in its greatest breadth.* This is said not to have been an exceptional leaf, many being as large or nearly so; they far exceeded any average leaves in the crops of Maryland tobacco. Farmers can calculate for themselves what would be the yield of 4000 or 5000 such plants per acre, with an average of 14 such leaves to the stalk.

Boston Journal of Chemistry.

Jas. R. Nichols, M. D., *Editor.*
Wm. J. Rolfe, A. M., *Associate Editor.*

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BOARDS OF HEALTH.

Boards of health as established by law in our States, cities, and towns are important bodies, and the gentlemen composing them occupy positions of great responsibility. They should be selected with much care, and no man of questionable honesty, competency, or judgment ought to be permitted to act as a member of any board of health. The mischief they may cause by erroneous statements and opinions is incalculable. In the reports which they publish from time to time, such information should be presented upon sanitary matters as is absolutely reliable. By no possibility should these reports be made the vehicle for the dissemination of erroneous views upon public hygiene, or statements regarding special sanitary matters made by incompetent or prejudiced writers.

It is true the formal reports published at much expense by States and cities are not generally read by the public, but the various articles are usually discussed in the newspapers, and through these channels erroneous statements, if the reports contain such, reach the general reader.

The last annual report of our State board contains an article by a physician of this city which is doing, in our view, an immense injury to the public health. We allude to the article in which the deleterious influence of the salts of zinc, as introduced into the system through zinc-covered water pipes and culinary vessels, is elaborately discussed. This paper presents what appears to be an exhaustive treatise upon the question at issue, and it is received as such by some physicians and by others who have become acquainted with the conclusions of the writer. The conclusion reached is that the zinc salts *are not* poisonous to the animal economy, and therefore zinced iron pipes may be used by families for the conveyance of water, zinced vessels may be used for culinary purposes with entire safety, etc. And this paper appears in the Report of the Massachusetts Board of Health! We are far from imputing to the writer any selfish designs or wrong intentions in publishing this paper; it is enough to say that its influence *is* wrong and dangerous, and the public should be warned against being misled by it.

The proofs that the salts of zinc are poisonous when introduced into the system through potable waters or cooked foods are conclusive and overwhelming. The array of authorities in support of the opposite view which the author presents has a formidable appearance; but careful consideration and examination in the light of the facts which have appeared in the last ten years prove that it should have little weight. Our readers well know regarding the cases of harmful and fatal poisonings by zinc which have been published in the Journal. They have come, not alone from non-professional sources, but from some of the most careful and sagacious medical men in the country. Cases of poisoning have repeatedly occurred under our own observation, and by no possibility can there be a mistake in the matter. Recently the pupils of a well-known school in this State were troubled with unpleasant illnesses difficult to account for. Examination of the premises disclosed the fact that the water used for drinking purposes flowed through more than a hundred feet of "galvanized" iron pipe. The removal of this pipe removed the illnesses speedily. A physician residing in a town a few miles from this city has recently been made seriously ill by using water drawn through zinced pipes. The instances are numerous, and the facts indisputable.

Why medical gentlemen should be willing to sanction the use of appliances or devices by which the salts of any of the metals can be introduced into the water or foods we consume in our dwellings is a matter difficult to understand. Metals are not foods, and their possible deleterious influence cannot be disregarded. When the Journal first called attention to the dangerous nature of the metal zinc, it was strenuously denied by writers in first-class medical journals that waters brought in contact with zinced surfaces carried any of the salts of the metal. Chemists all over the country soon dispelled this error, and now the reports of our boards of health are used to convey assurances to the public that although waters used for culinary purposes *do contain* these salts, they are perfectly harmless. Men, women, and children, everywhere, no matter what may be the idiosyncrasies of organization, are told that zinced pipes and vessels are as safe in our wells and in our kitchens as those of silver. If strange illnesses occur in families, illnesses which baffle the skill of physicians, the medical men need not be suspicious of "galvanized" water pipes, or zinc water fountains or stewpans. If by oxidation these saturate the water or the foods with metallic salts, they can cause no injury. These are the teachings of a "board of health." Zinc is one of the most easily oxidizable and uncleanly of the metals, and entirely unsuited in its chemical behavior for use in the construction of domestic utensils or water pipes, even were its salts not poisonous. This subject is one of great importance, and we are led to again give it attention from the circumstance that so respectable a newspaper as the New York *Journal of Commerce* has recently recommended the use of zinced water pipes; and when its statements are disputed by another journal, the *Iron Age*, it appeals to the Report of the Massachusetts Board of Health to confirm the correctness of its statements. This is not only a mortifying fact, but it excites apprehensions of evil consequences. We have said much upon this subject in the past, but when the public health is jeopardized by the employment of poisonous agents in connection with domestic appliances, no apology is needed for persistent warnings and unremitting efforts to abate the evil.

TOUGHENED GLASS.

Reference has already been made in the Journal to the great expectations raised by the statements published concerning the Bastie or toughened glass. It was alleged that vessels of glass subjected to De Bastie's process became so tough that they could not be broken by any ordinary blow. The public were led to believe that a new and most important discovery had been made, but there are some facts which have re-

cently come to light which would seem to disparage the claims of the inventor. Mr. T. Gaffield, of this city, has long been a student in all matters pertaining to glass, and he makes the following comments upon this new product: —

May I not ask whether the Bastie glass is anything more than a Rupert's drop on a large scale? It is much tougher and harder than common glass, because unannealed and tempered in oil, but it is not *unbreakable*. It only requires a harder blow to break it than common glass. It is wrong and false to science and truth, to compare it with iron or tin. I witnessed one of the exhibitions of the tests of the strength of this glass. To be sure, many specimens thrown on a wooden floor did *not break*. But *some* did, and were said by the exhibitor to behave badly. All will break, if allowed to fall from a greater height; and if thrown upon a stone step, which has no elasticity, they will sometimes break at a few feet. At least, the only specimen I ever saw in Boston broke on Briggs's doorstep in that way, although it stood other tests very well. But tin and other metals would not break in this manner at all, and therefore it is a misnomer and an imposition upon the credulity of the public to speak of it as being unbreakable as a sheet of metal.

Again, it is said that it can be cut and engraved like other glass. Now this is not true. You can cut a piece of flint glass on the wheel through its entire thickness without danger of fracture. Grind a Rupert's drop through a short distance and it will fly into a thousand fragments, and just so will the Bastie glass fly. I have seen a piece subjected to Tilghman's sand-blast process, which burst into myriads of fragments after penetrating a slight depth into the surface.

Again, many of the specimens exhibited are not transparent, but only translucent, having lost their transparency, I suppose, in going through the transformation process, in being submerged in the hot oily mixture. Now this is a great drawback, as the chief beauty of glass consists in its transparency.

Again, the Bastie glass cannot be cut with a diamond. This also is a serious drawback, especially in the use of glass for photographic negatives, or for window panes, which frequently have to be cut to special sizes.

Speaking of window glass leads me to say that the peculiar fracture of the Bastie glass would prejudice its general adoption by glaziers. Although it will stand a much harder blow than common glass, yet I think it would not be proof against the explosion of a neighboring store, or against the impetus of a stone or brick thrown on purpose or by accident. Now in ordinary glass, quite a saving is made from the large lights cut from the broken pieces, while the Bastie glass is shivered to splinters and is a total loss.

A baking dish of this glass, if by accident it should be broken and explode its minute fragments in the oven, would make bad work of all its contents, as broken glass is a dangerous article of diet; while a stone-ware dish would be fractured in large pieces, which could be removed without injury to the loaf of bread or cake it might contain.

A NEW METAL.

The discovery of a new element is an event in the history of chemistry that must not be allowed to pass unchronicled. It is some fifteen years since there was an opportunity of making such an announcement, for new elements are much rarer nowadays than new planets, half a dozen of which are often picked up by astronomers in a single year.

This latest addition to the list of elementary substances is to be credited to M. Lecoq, an amateur chemist of Bois-Baudran, Cognac, and has been named by him *gallium*, "in honor of France," the ancient Gallia. In a note presented to the Academy of Science, September 20, he reports that he first found indications of the existence of the new body "between three and four P. M. on the 27th of August, 1875." It has not yet been isolated, and its physical characteristics therefore remain unknown, but from the chemical behavior of its compounds it appears to be a metal related to zinc and cadmium, in connection with which it was found in a blende from Pietrafita, Spain. The forms under which it is at present known are those of the chloride and sulphide. While experimenting with the spectroscope on the products of the analysis of the blende just mentioned, M. Lecoq observed a violet line in the spectrum which evidently did not belong to any known element. This line was situated at about 417 on the scale of wave-lengths; and there was also a fainter violet line at 404. Further examination fully satisfied him that these violet rays were indeed the luminous language by which a hitherto undiscovered metal announced itself. Probably it will soon be made to show itself in its simple metallic form, and we shall then know how it looks. Its chemical affinities, as already stated, connect it with zinc.

This is the fifth metal discovered by means of the spectroscope, the others being cæsium, rubidium, thallium, and indium, which were found in 1860 and 1861. But for this wonderfully delicate instrument of analysis, they all would probably have remained unknown, at least in our day and generation. Cæsium and rubidium were found by Bunsen and Kirchhoff while analyzing a spring water which contained only two or three grains of the metals to a ton, and by no other method of analysis could their presence in quantities so minute have been detected. Thallium, which was discovered by Crookes, betrays itself in the spectroscope by its characteristic green line if one fifty-millionth part of a grain is volatilized in a flame, an amount far too small to be recognized by any other method known to us.

These metals, with the exception of the new gallium, are all named from the colors of their distinctive spectroscopic lines: cæsium from the Latin *cæsius*, sky-blue; rubidium from *rubidus*, dark red; thallium from the Greek θαλλός (*thallos*), a young green shoot; and indium (which was discovered by Reich in a specimen of blende from the Freiberg mines) from *indigo*.

Gallium is not the first element discovered in France, though it is the first for nearly half a century. Bromine was detected by Balard in 1826, and iodine by Courtois, a Paris soap-boiler, in 1811. The credit of discovering magnesium is sometimes ascribed to Bussy, who in 1829 or 1830 first obtained it in sufficient quantities to test its properties; but Davy as early as 1808 had satisfied himself that magnesia was the compound of a metal with oxygen. Vauquelin discovered chromium and glucinum (the oxide, at least, for the metal was first isolated in 1828 by Wöhler) in 1797.

No new element has as yet been discovered by an American chemist. It is a pity that the country should not be able to claim one before the centennial celebration of next year. It might appropriately be christened *Columbium*, a name which was at first given to niobium, and by some authorities to tantalum; these two rare metals having been for a time considered as identical. Niobium and tantalum are now the names generally adopted by writers on chemistry, and columbium is a name without a substance, — *vox et præterea nihil*, — available for any Yankee who can find an element to match it.

EDITORIAL NOTES.

Whole Wheat Flour. — The manager of what is known as the Cold Air Attrition Flour Mills, at Chicago, forwarded to us a sample of their whole wheat flour, sometime in August, for trial. As the method of doing business adopted by this concern was manifestly fair and business-like, we decided to give their products a careful examination and trial. This we have done, and take pleasure in reporting favorably upon their flour. The wheat which they grind is evidently of the best quality, and their methods certainly are hardly to be surpassed. The flouring of the wheat is done at one operation and in large and powerful currents of cold air, and no bolt is used to separate the outside covering of the berry, in which reside the rich nitrogenous and phosphatic principles. The flour is several shades darker than the popular kind, but this is unavoidable, and of the slightest possible consequence. The bread which our cook has succeeded in producing from it is rich and excellent. It requires a little skill at first to manipulate the flour and adjust the ferment; but when the right process is learned there is no difficulty in securing light, palatable, and nutritious bread. This variety of flour must in time displace the other, and there is no good reason why the white, starchy flour should be used at all in families. However, great reforms do not come about suddenly, and so we must wait for prejudices to give way. The number of families who clearly understand the importance of good, nutritious bread is very large, and increasing every day.

Messrs. Billings, Clapp, & Co. in New York. — From an announcement in our advertising columns it will be noticed that Messrs. Billings, Clapp, & Co. have established a branch house in New York city, where a complete assortment of their fine chemical and pharmaceutical laboratory products may at all times be procured at the same prices and terms as in Boston. This extension has become necessary in order to accommodate their large and rapidly increasing business, and the selection of so central a place as 58 Maiden Lane (next door to Powers & Weightman) will be highly appreciated by their many patrons, and such other druggists and physicians as may wish to obtain pure chemical and pharmacal preparations, and have not heretofore found it convenient to call at their Boston office.

The office in New York will be in charge of Mr. William L. Brayton, who has been connected with the house for the past seven years, and has a large acquaintance with the Southern and Western trade.

English Cars on American Railways. — Some twelve years ago the Old Colony Railroad Company built a couple of compartment cars, in the English style, and has since used them on the Fall River steamboat train. There are probably thousands of people riding daily on that railway who never happened to learn this fact, but the news has crossed the Atlantic and appears in *Iron* in the following form: —

"The latest improvement in American travelling, the luxurious Pullman car, has been naturalized in England, and there seems a somewhat widespread desire to arrange railway vehicles altogether on the American system. That being so, it is rather amusing to find that the Americans are adopting our exclusive classification of passengers, so far, at least, as the Old Colony Railroad of Boston is concerned,

where they have, we are told, adopted the orthodox English first-class carriages, and find them popular. One journalist praises the ease with which ingress and egress is obtained with carriages on this system compared with those of the American pattern, which have only one entrance and exit, as well as the superior handiness of the English carriages, especially for rapid local trains; but probably some part of the inducement to use them is the facility they give for the separation of wholesales and retails."

A MYSTERY SOLVED. — The nature of life has been a standing problem for philosophers, but the question is now happily settled. A Mr. H. A. Huntley, an English analytical chemist, has written a pamphlet, published by the Longmans in London, in which the following lucid explanation of the mystery is given: —

Thermo Dynamical Phenomena — or as some term it — "*Life*" from the lowest Organism a fungus, or a monad, up to man — is a simple, — and by gradual cosmic Evolution a most complicated kind of machinery — is matter — living matter (sensible or kinetic,) however by Cosmic Evolution to-day, either in the speck of *Bioplasm* in the cell of a fungus — a dog — or a man, — or in the numerous Bioplasts of their various textures respectively. But — nevertheless the remote RESULTS by Evolution (cosmic) of *Primeval*, *Potential* or Non-Living matter, effected by the *Primeval* vibration of Thermo Dynamical action upon our earth, — (in the recesses of her remote antiquity, and when, (as has been advanced) she maintained favorable conditions for the display of Thermo Dynamic action), with the production of low forms of Organisms upon her adaptable surface. — These low organisms being Matter, dependant upon *matter* palladium — in the form of solids and gases dissolved in water. More complex organisms, as the Flora and Fauna — being Matter pervaded by a current of the Energy Heat — dependant upon more complex palladium, as Vegetables, etc., — effected in both by the processes of *nutrition* and *accretion*.

ATOMS.

A LOCOMOTIVE steam-crane for doing the heavy lifting at railway stations, and capable of moving itself from place to place along the track, has been put in operation in England, and is said to work well. — A new route from England to the Continent has been opened from Sheerness to Flushing, where connection is made with the net-work of Dutch railways, and the vessels placed on the line are of large class and fitted up like ocean steamers. — In St. Mark's Library, at Venice, there is a MS. in the handwriting of John Locke, consisting of notes on medical subjects, which is the more curious if, as has been said, Locke was averse to allowing it to be known that he once intended to practise medicine. — An attempt to acclimatize caoutchouc-yielding trees in the island of Bourbon is being made; *Cryptostegia Madagascariensis*, a plant which begins to yield india-rubber the first year, is being raised in great numbers. — The commission appointed by the Prefect of the Seine to report upon lightning-conductors, and the method of constructing them, recommend the use of copper terminal points instead of platinum. — A comparative trial of the relative advantages of dynamite, gun-cotton, and gunpowder was recently made at the railway tunnel works under Clifton Down, in England, with the result of showing that dynamite is much superior to either gun-cotton or gunpowder. — A collection of prehistoric animals from the Thames Valley, deposited in the British Museum during the present year, contains remains of no fewer than 100 elephants, all of which were found at Ilford; those of ruminants (as the stag, bison, ox) constitute about a half of the collection, and there are 86 specimens of rhinoceros remains, 7 of great Irish elk, and 50 of red deer. — Dr. E. J. Morgan, of Manchester, in his little book on the deterioration of the English race by the ever-increasing populousness of great cities, states that "in the manufacturing districts four out of every five of the recruits sent up by the sergeants for medical inspection are rejected on the ground of physical disqualification." — It will be useless to inquire for monomethylprotocatechnic acid at the apothecary's, but it is interesting to know that a compound bearing that euphonious name has been obtained in Germany by Herr F. Tiemann, whose post-office address we regret that we are unable to add. — When the cultivation of cochineal was introduced into the Canary Islands in 1840, the product was worth 12 francs per Spanish pound; but mainly owing to the increased use of aniline colors, the price had fallen to 4 francs in 1870, and to 2½ francs in 1873. — *The American Chemist* for September contains several of the most valuable chemical papers read at the Detroit meeting of the American Association, with other valuable articles on theoretical, analytical, and technical chemistry. — More than a million clay pipes are imported into this country annually, the greater number being the celebrated "T. D." brand; these pipes are made in Glasgow, Scotland, and chiefly by one firm, W. White and Sons, honest old Quakers, a house that has existed for nearly a century and a half. — The scale on which they do business at the Fairbanks Scale Works, St. Johnsbury, Vt., is shown by the fact that in a single week in October 175 hay scales were made, or an average of one scale for each twenty minutes of the working hours; and in the same week there were sent from the factory thirteen car loads of other scales, the weight of which amounted to 140 tons.

LITERARY NOTES.

MACMILLAN & Co. have just published *A Practical Treatise on Diseases of the Eye*, by Robert Brudenell Carter, Ophthalmic Surgeon to St. George's Hospital, London. The author's aim, as stated by himself, has been "to place before the profession, in a concise and readable form, a general view of the present state of knowledge with regard to the nature and treatment of the more important diseases of the eye;" but he has "not thought it necessary to dwell minutely upon maladies of rare occurrence, or upon details which are interesting only to specialists." The book embodies the substance of his lectures at St. George's Hospital, and the modes of practice described are mainly such as he is able to speak of from experience. The illustrations are also, with few exceptions, original. After an introductory chapter on the anatomy and physiology of the eye, the methods of examining the organ are given, with an account of the ophthalmoscope and its applications, and an able summary of the principles of ophthalmic therapeutics and surgery. The diseases of the various parts of the eye are then taken up in order, and finally the uses and selection of spectacles are explained. The volume is issued in the faultless style which characterizes all Macmillan & Co.'s books.

The *fifth* edition of *Heath's Manual of Minor Surgery and Bandaging* has been reprinted by Lindsay and Blakiston in a neat little volume, sold for $2.25. Every page of the work has been carefully revised, and such alterations as the author's experience or the suggestion of medical friends rendered advisable have been made. Several new wood-cuts have been added, to illustrate surgical appliances in common use. The book is a convenient and reliable guide for the student and the young practitioner, and its value has been materially enhanced by this revision.

The same publishers have now ready their *Physician's Visiting List for* 1876, in the usual variety of sizes and styles. This professional *vade mecum* has been issued for twenty-five years, and it would be superfluous to commend it now. We may add that Messrs. Lindsay and Blakiston have just prepared a revised edition of their *Catalogue of Medical, Dental, and Pharmaceutical Publications*, which they mail free to any one applying for it.

The Mechanic's Friend, edited by W. E. A. Axon (Van Nostrand, $1.50), is a collection of receipts and practical suggestions relating to every department of the mechanical and chemical arts. They have been selected from the pages of that encyclopædic periodical, the *English Mechanic*, and are illustrated with many diagrams and wood-cuts. The book will be equally useful to the artisan and to the amateur.

Mr. C. J. Brockway, in a sixty-page pamphlet entitled *Mineral Deposits in Essex County, Massachusetts*, describes the new mining district of Newbury and vicinity. The appended map is worth the half-dollar asked for the book, which may be found at Williams & Co.'s, with the works already noticed.

The Harpers have now ready *Select Poems of Oliver Goldsmith*, edited by W. J. Rolfe, A. M., uniform in style with his editions of Shakespeare's plays. He has aimed to furnish a text critically accurate, with all the notes needed for its thorough elucidation and illustration. The introductory matter includes Macaulay's Life of Goldsmith, the best part of Thackeray's delightful lecture on the poet, and extracts from Foster's, Irving's, and other memoirs. The book is copiously illustrated with woodcuts, most of which are reproductions of those designed by members of the Etching Club for Corney's elegant edition, published in London. It is the first American edition of Goldsmith adapted to school use; and the publishers have done their part so well that it would be hard to find a prettier gift-book for the price, which is only 90 cents.

Messrs. Roberts Brothers have added to their valuable and attractive list of French translations *Madame Récamier and her Friends*, by Madame Lenormant. It is translated by the same hand as "Madame Récamier's Memoirs," which it supplements and completes, giving the letters she wrote, as that gave the letters addressed to her. Nearly half the book is devoted to her correspondence with the younger Ampère, who inherited the genius, though not the scientific tastes, of his father, the great natural philosopher. The latter also figures to some extent in the book, with Guizot, De Tocqueville, Châteaubriand, and many other eminent Frenchmen.

The same house publish Miss Alcott's *Eight Cousins*, which has long been the chief serial attraction of "Saint Nicholas." In its completed form it will find thousands of new readers.

The *U. S. Postal Guide* (Hurd and Houghton) begins its second year with the October number, which, among other fresh matter of interest, contains a revised list of post-offices by counties, with Dr. J. M. Toner's ingenious method of designating the relative position of the counties in each State. The new "rulings" of the Post-Office Department are more than usually important, and fill nine entire pages. No one who has much to do with the post-office can afford to dispense with this useful quarterly, which costs only $1.50 a year.

Captain Hatteras, by Jules Verne (Osgood & Co.), is one of his earliest and one of his best books. It is a happy example of his skill in interweaving a large amount of scientific truth into the wildest kind of fiction. The voyages and adventures of the hero are in the Arctic regions, and no veritable record of an actual navigator could give more vivid pictures of the scenery and life of those polar climes. The book is profusely illustrated, and will be eagerly sought after by the young folks.

The Victorian Poets, by E. C. Stedman (Osgood & Co.), is not a mere collection of critical sketches, but a connected historical review of the course of British poetry for the past forty years. It thus furnishes a much-needed supplement to the standard histories of English literature, which either stop short of the Victorian epoch or give only a meagre sketch of it; and it has the rare merit, for such a history, of being written by a critic who is himself a poet, and therefore as sympathetic as he is acute in dealing with his subject.

Tales of the Argonauts and Other Sketches, by Bret Harte (Osgood & Co.), contains the author's more recent contributions to the magazines, some of which have quite the racy flavor of his early Californian sketches.

In Longfellow's new book, *The Mask of Pandora and Other Poems*, the poem which furnishes the title is published for the first time. This, with the Hanging of the Crane, Morituri Salutamus, and more than twenty minor poems and sonnets, makes a volume not inferior to the best the author has ever given us.

The remarkable popularity of the "Little Classics" has led Osgood & Co. to bring out an edition of Hawthorne in the same dainty style, and *The Scarlet Letter* is the first issue. It will tempt many who have not a full set of Hawthorne to supply that deficiency in their libraries. One appreciates these little books as his shelves become crowded, especially as the type is of good size and they are so cheap withal. They may be found, with all the new books of the day, at Lockwood, Brooks, & Co.'s.

The Facsimilist is the name of a new periodical to be edited by Mr. Justin Winsor, the Superintendent of the Boston Public Library, who sketches his plan thus: "A quarterly journal of rarities in bibliography, archæology, palæography, cartography, and in every department of learning where that pictorial illustration is best which is the exactest in reproduction; intended to make better known the resources of the public and private collections of the country in advancing critical studies. Specialists will be called upon to furnish the text, and the heliotype process will be very freely used in furnishing the requisite facsimiles, say, of the titles, distinctive pages, cuts, colophons, cancelled leaves, etc., of rare books; the binding of famous binders; the distinctive type of remarkable printers; the rarest engravings; early and MS. maps; likenesses of historical characters, whether from choice engravings or original paintings or crayons; book plates, etc., of collectors; manuscripts, peculiar, rare, and historical; old paper money; specimens of early printing, etc." Messrs. J. R. Osgood & Co. are to be the publishers.

The 4th number of *The Floral Guide for* 1875, published by James Vick, Rochester, N. Y., has appeared, making over 200 pages of choice floricultural reading, copiously illustrated, which he has furnished for 25 cents, the price of the quarterly for the year; and he promises that the 1876 issue shall give even a more generous return for the money.

The *Philadelphia Medical Times* (see our "Clubbing List") is to be published fortnightly hereafter, instead of weekly. The numbers will be made larger, but the price is to be reduced from $5.00 to $4.00 a year.

Medicine and Pharmacy.

COMMON SENSE IN THE SICK-ROOM.

THIS is the title of an excellent lecture delivered at the Bellevue Hospital Medical College, by Prof. A. B. Crosby, and reported in full in the *Medical Record*. The following extracts on two of the most important topics treated will interest both professional and non-professional readers.

VENTILATION.

This is another point which should always engage your attention, for the same person, when sick, demands a much larger supply of fresh air than when well. For instance, if a healthy person requires two thousand cubic feet of breathing space, the sick person under the same circumstances should have at least three or four thousand cubic feet. Then, again, the sick man should have the air changed twice as frequently as the man in health.

Ventilation requires the introduction and diffusion of an abundance of pure air at short intervals, and a corresponding removal of the air vitiated by respiration. The movement of air in the sick-room should be imperceptible. At a temperature of 55° to 60°, air moving at the rate of three feet per second is perceptible. Any more rapid movement than this gives rise to a draught of air, and will endanger the patient.

It is essential that the air should be thoroughly diffused, and then be removed after being breathed once.

It is claimed by some that the "law of the diffusion of gases" will insure perfect ventilation. But this law acts slowly; whereas the vitiation of the air by respiration goes on rapidly.

Others think that the wind can be made to ventilate thoroughly. The objection to this is that the wind is not constant, and incessantly varies in velocity and force.

The most reliable method is that which depends on the variation in the weight of the air by heat.

In every attempt at ventilation we are to first settle the question whether the impure air is to be removed from the apartment at the base or at the ceiling. The latter method is far inferior to the former.

If there is a hot-air register in the floor on one side of the room, and a ceiling ventilator on the opposite side, the hot air will rise immediately to the ceiling, along which it will glide, and escape through the ventilator. Meanwhile, the bulk of the air in the room will hardly have been disturbed at all, and in sleeping-rooms, especially, there will be very little diffusion. We are not to lose sight of the fact that carbonic acid gas is much heavier than atmospheric air, and that the bad air will naturally gravitate to the lower part of the room. A heated flue, with an opening at the base, will remove the bad air rapidly and insure the best diffusion. The old-fashioned fire-place answered the same purpose, and is by far the simplest and best method of ventilating any sick-room.

If the chimney has a throat one and one half feet square, with a good fire, the air will move through the chimney at the rate of four feet per second, and air will be discharged at the rate of six cubic feet per second, which would be at the rate of 21,600 cubic feet per hour.

Supposing a room of the capacity of two thousand cubic feet, with a fire-place as above, and with three persons in the apartment. The doors and windows all being shut, the air would still become bad through lack of proper diffusion. The whistling of the air about the windows of such a room — fairly shrieking to get in — can always be heard.

If we now open a window farthest away from the fire-place *at the top*, diffusion and ventilation will be good enough.

If the sick-room is ventilated by a fire-place, we should always open a window at the top. If the room, on the contrary, is heated by a register, a window should always be raised at the bottom, since the hot air rises to the top of the room, creates a plenum, and so forces the air out at the bottom. There are three points to be observed in regard to the sick-room. Note, first, whether there is any perceptible odor on entering the apartment from the open air; if so, ventilation is imperfect.

Make sure, in the second place, that there is a free inlet and outlet for the air.

And thirdly, place an open-mouthed bottle by the side of the bed at night. In the morning, before there is any opening of doors or windows, or any movements about the room, pour a little clear lime-water into the bottle and shake it. If the air in the bottle is pure, the lime-water will remain clear; but if otherwise, it will become milky in appearance, showing carbonic acid in the air, which has united with the lime, forming a white precipitate of the carbonate of lime.

DIETETICS.

A man, simply because he is sick, is not to be starved, nor, on the other hand, can a man who is sick, as a rule, take such articles of food as a well man would be likely to take.

It may be doubtful whether a man when first taken sick should eat a large quantity of food, but one of the articles which he may have is *Indian gruel*, if not made too strong. If, however, you give permission that the patient may have gruel to take, unless you give special directions as to how it shall be made, you will very commonly find that the nurse has prepared a fair specimen of Indian pudding, and has been administering that for gruel.

In making Indian gruel there should be no more than a dessert or table-spoonful of the meal to a quart of water, and this should be boiled for a long time, keeping the quantity of water good throughout the entire boiling process.

Prepared in this manner, it may be made decidedly salt, and then administered to the patient during the first few days of his sickness. There is one article of diet which all persons may take under all conditions, and that is *milk*.

There are those who say they cannot take milk, that it makes them bilious, etc.; but that is not true. A person who is sick may take milk with the greatest possible advantage, because it contains, in a form easy of assimilation, all the elements essential for maintaining nutrition. It is the natural aliment of the young animal, and certainly answers a good purpose for the old animal, provided it is used properly. New milk, I do not hesitate to say, may be taken, as far as disease is concerned, in any and every condition. Perhaps it will require the addition of lime-water if marked acidity of the stomach is present; and perhaps a little gentian may be requisite to stimulate the stomach somewhat; and it may be necessary to give it in small quantities and repeat it often; but ice-cold milk can be put into a very irritable stomach, if given in small quantities and at short intervals, with the happiest effects. We have now come to believe, contrary to the teaching of our fathers, that *cold water*, even ice-cold water, is a most beneficial drink, and therefore permit our patients to have it as often as they may wish, provided too much is not taken at any one time.

Now, *tea*, which is a wholesome beverage, and withal contributes somewhat to scandal, is very comforting, especially to a sick woman, and may be given without harm if it is sufficiently diluted with milk. When made very weak — just strong enough to give a flavor — well supplied with milk and perhaps a little sugar, it gives the patient a trifle of nourishment in a very palatable form.

There is another article which has long been known in the sick-room, and that is *beef-tea*. This is not only agreeable to the taste when properly made, but it is one of the very best methods of administering nourishment. There are many who say that there is little or no nourishment in beef-tea, but it does nourish men, otherwise they could not live as long as they do upon it. I admit that bad beef-tea is not very nutritious; and it is perhaps the exception that patients get good beef-tea. It is this fact, perhaps, which, as much as anything, has led to its disuse. If, however, you will make beef-tea according to the directions I now give you, it will be found to be a most serviceable article among the dietetics of the sick-room.

Take a pound of the very best beef that can be obtained in the market, — the butcher will tell you that any kind of a piece answers to make beef-tea of, but that is not true, — cut it into small pieces the size of the end of the thumb, place it in a pint basin, cover with cold water, and then place the dish upon the back part of the range or stove, where the water will gradually get warmer and warmer, but will not reach the boiling point. Let it stand and simmer in this manner two hours. Then bring it forward, and boil over a quick fire twenty minutes, and immediately after pour the fluid from the beef, at the same time allowing the little particles which become detached to flow off with it. Now, if there is any fat in the tea, it is well that it should be removed, for the reason that the bile and pancreatic secretion may be unable to emulcify it, and it may do more harm than good. If you wish to be very precise upon this point, the tea can be set aside, and when perfectly cold all the fat can be removed from the surface in a flake; or the fat may be taken up by dropping a piece of flannel upon it as it floats on the surface of the warm tea.

It is not a good plan to strain the liquor, because this process will remove more or less of the little particles of beef, which are very essential to the value of the tea. It may now be salted, and given hot or cold, as the patient may wish; and it may be given as soon as the pulse indicates any diminution in the force of the heart's action. What becomes of this article of diet when taken into the stomach? The advocates of the worthlessness and non-essential in beef-tea would answer that it makes but little difference. I believe, however, that it is mostly taken up by the gastric veins, and at all events that it is exceedingly palatable and nutritious, and does do something more than simply warm the stomach and make the patient happy for a short time.

In case the patient's stomach is very irritable, so that large quantities of any substance cannot be borne, you may resort to *beef-extract* for nourishment.

The proper method of making this article is to take a pound of the best beef, cut it into small pieces, and place it in a good-sized open-mouthed bottle; a pickle-jar is perhaps as convenient as any. Cork the bottle loosely, and then set it into a kettle of water, which is to be kept boiling for two hours. If the bottle is now removed it will be found that it contains a considerable quantity of fluid, which may be turned off, and the beef subjected to slight pressure to remove still more.

In this fluid we have a concentrated article of nourishment, and it may be given, after it has been seasoned, either pure or diluted, according to the condition of the stomach. Beef-extract is not nearly so palatable an article of food as rich beef-tea made in the manner described. Ordinarily, however, the tea is badly made, and contains but little beef and considerable water.

HOW TO TREAT A COMMON COLD.

Dr. J. M. Fothergill, in an article on this subject in the London *Practitioner*, remarks: —

Rarely is any impression made upon the pyrexia until the action of the skin is excited and the cooling effects of exhalation attained. The administration of nauseant diaphoretics to attain these ends has been the rule among practitioners and housewives. The time-honored antimonial wine has scarcely yet yielded to its rival, ipecacuanha; nor, perhaps, is it desirable that it should. Their combination is good and to be recommended. In adults, iodide of potassium in guaiac mixture forms an excellent combination, especially when the cold is combined with rheumatic pains or tonsillitis. These internal remedies may be aided in their action by external measures, such as warm baths. With children it is easy to wrap them up in a blanket wrung out of hot water, to inclose them so wrapped in a dry blanket, and to put them into bed. This may be repeated as required, and sufficiently aids the remedies given by the mouth. Measures for giving adults a warm bath in bed are now to be procured at little cost. After perspiration is once induced, there is usually a gradual fall of temperature; but the normal may not be reached for some days. There is a decided tendency to excessive heat-loss after the action of the skin has been established, even though the temperature indoors be above the normal. Experience has taught humanity to wrap up well when passing through a cold, especially when it is breaking. Ere the action of the skin is reëstablished, the impression of external cold is grateful, but afterward chills are readily experienced. The increase of blood in the heat-losing area permits of rapid heat-loss. When a cold is caught during the restorative period it is usually a fixed one, and not rarely serious illness is the consequence.

When the action of the skin is reëstablished, it not uncommonly happens that perspiration is profuse, even while the patients wrap up well to shield themselves from heat-loss. This is a troublesome stage in the history of a cold. Here mineral acids with vegetable tonics are indicated, and perhaps, best of all, dilute phosphoric acid in cascarilla or cinchona. In the treatment of influenza, vegetable acids along with a bitter tonic should be given.

In the treatment of the bronchial affections which so commonly accompany an ordinary cold, it is not a matter of indifference what expectorant remedy is selected. As long as the skin is dry, and the bronchial lining membrane tumid, and secretion arrested, ipecacuanha with acetate of ammonia is indicated; or a little antimony may be added with advantage. When the skin is once thrown into action and the bronchial secretion also established, then acids with syrup of squills are suitable measures. But it is not a successful plan to administer squills with acids until the skin is moist. When there is a tendency to the free action of the skin, this latter combination in full doses is a useful plan of treatment. Neither is the union of carbonate of ammonia and senega, in severe cases, indicated until the secretion alike of the skin and the bronchial lining membrane is thoroughly established.

IVY POISONING.

Dr. James C. White, in *The Boston Medical and Surgical Journal*, advises all who are unacquainted with the poisonous ivy to avoid any vine or bush growing by rocks, fences, and woodsides, and having glossy leaves arranged in threes. He says there is no danger of contagion by contact with the eruption upon another person. In regard to treatment, as the poison is a volatile acid, an alkali would therefore suggest itself as the most fit agent to counteract its action. Thorough washing of the parts, as soon as possible after contact with the poison, in cooking-soda or saleratus water, or in strong soap-suds, especially those of soft soap, which contains an excess of alkali, is therefore the best primary treatment. When these or other alkaline preparations are not to be obtained, an abundance of water alone should be used as soon as possible. After absorption has taken place, or the eruption has begun to show itself, less benefit is to be expected from such applications alone. Remedies are then to be used which will best control and shorten the inflammatory process in the tissues of the skin, — those, in fact, which are found to be most efficacious in corresponding stages of acute eczema. Among these are some which have a special reputation, as solutions of acetate of lead or sulphate of copper, applied frequently as a wash. Perhaps nothing is better than common black wash used as an evaporating lotion for half an hour at a time, twice daily, the lime-water acting also as a chemical antidote, if possibly such action is still in season at this later stage. In the intervals between the applications of these washes the parts may be kept covered with cold-water dressings, with plasters of diachylon ointment, or with a powder of starch and oxide of zinc, according to the rules familiar to physicians for the treatment of acute eczema. By these means the process is checked and shortened, and the sufferings of the patient are greatly alleviated.

HISTORICAL AND ETHNOLOGICAL NOTES.

How Sea-Sickness was Prevented Two Hundred Years ago. — Rather more than two hundred years ago, a princess of England went to Belgium, and to prevent sea-sickness the great doctor of the day, Sir Theodore Mahern, issued the following instructions, which, perhaps, some ladies may still be disposed to try: Cinnamon, coriander, anise, ambergris, musk, and sugar were to be made into long tubes, which she was to munch from time to time. She was to drink a warm posset, should there be an excess of vomiting. A plaster made of balsam of Peru, of gum mastic, and of laudanum was to be applied to the stomach. She was also to smell the comforting vapors which arose from the following compound: well-toasted bread, orange and citron peel, rose leaves, flowers of lavender, and cloves, to be hashed up together. On this Canary wine, elderflower vinegar, and cinnamon water were to be poured, portions to be successively applied to the nostrils. When she arrived on the other side she was to have an aromatic plaster applied to the stomach, and, what was more to the purpose, she was to have her stomach strengthened with burned claret, having in it a sprig of rosemary, some cinnamon and sugar, or with a caudle of ale or small beer made with Canary wine, eggs, sugar, and cinnamon. Such were the ways of comforting that distressed organ.

An Ancient Prescription. — A correspondent of the *American Bibliopolist* says: "I have just met with the following prescription in an old Italian book, printed at Venice in 1644: —

Questo è un rimedio santissimo per la testa dato da mistro Michele Savonarola.

Recipie — Specierum aromatici rosati . . drag. iiij.
Trium sandalorum . . . drag. ij.
Zucchari albissimi . . . . drag. x.

Et cum aqua bugolosa, et rosata, et fiat confectio in rotulis tres pro unaquaque dragma.

"This Michele Savonarola was, I presume, the grandfather of the celebrated Savonarola. He was a distinguished physician, and invited to Ferrara by Nicolo d'Este. If all his prescriptions contained such nice ingredients, it is not surprising that he became famous. The one here given reads like the old nursery rhyme: —

Sugar and spice, and all that 's nice,
And that 's what little girls are made of."

Old but True. — The following sketch of a medical quack, by "Hippocrates Ridens," is as true now as it was in 1686, when it was written: "His sagacity is remarkable, for he hath found out an art both to conceal his own ignorance and impose on that of other folks to his own advantage. His prime care is to get the names of diseases without book, and a bead-roll of rattling terms of art, which he uses to beguile the mobile, first of their senses, and next of their pence. He has an excellent talent in persuading well people they are sick, and by giving them his trash verifies the prediction, and is sure to make them so."

Aboriginal Wooden Legs. — A discovery has lately been made on an island in the Mississippi which shows that the aborigines of America were not wholly unacquainted with mechanical surgery, but occasionally wore wooden legs when deprived of their natural limbs. In a subterranean cave hewn out of a huge solid rock, probably thousands of years ago, was found, among other remarkable articles, a skull as brown as a polished walnut, perfect in every respect, and of extraordinary size, also an almost complete skeleton with a wooden leg. The fastenings of the artificial limb consisted of petrified leather and bronze buckles. The original leg appears to have been removed half-way between the hip and knee. This discovery is regarded as extremely interesting, as not only proving that timber extremities were fashionable in early ages, but that a knowledge of bronze was among the learning of the aborigines.

Sleeping Habits of Negroes. — Dr. Bakewell, in his book "On some Common Causes of Pulmonary Consumption," remarks: "It is a curious fact that negroes, partly owing to their extreme susceptibility to cold and partly to their superstitious terrors of darkness, cannot sleep alone in a room, and prefer sleeping huddled up together on the floor. A negro's house of the better class, in the West Indies, always contains a large four-post mahogany bedstead, which is never occupied save in sickness — the floor being preferred. Very often in towns where rent is high the floors are covered with mattresses, and in a small room six, eight, or ten people sleep together. I have, when called in the night to see a case, sometimes had a difficulty in picking my way among the prostrate bodies of the colored people. Not satisfied with packing themselves in this way, they close every cranny and nook by which air can enter, and wrap themselves entirely round with a sheet, head included. They look like corpses ready for burial. Any more ghastly spectacle than a hospital for negroes at night-time cannot be conceived. They all lie on their backs, stretched out at full length, and enveloped in their sheets like winding-sheets. Being well aware of this peculiarity, during the small-pox epidemic at Trinidad, I had the small-pox hospital huts built with a plank left out all the way round, just under the roof. Thus, though they closed all the doors and windows at night, ventilation was carried on in spite of them."

THERAPEUTICAL MEMORANDA.

The Antifebrile Action of Salicylic Acid. — At a meeting of the Berlin Medical Society Herr Senator read a paper on the employment of salicylic acid as a means of abating temperature in fevers. He had especially tried it in the hectic of phthisis, having made fifty observations in ten cases. He found that under its use the temperature was undoubtedly diminished, but not so certainly as under the influence of quinine. In some of the cases its influence was quite surprising, while in others it was doubtful or not recognizable. He thinks that these negative results may be due to his having begun with

too small doses, or to the mode of administration. The effect was much more marked in intermittent fever. In five out of ten cases of this, the cure was complete after once or twice employing the medicine. The other five, being dispensary patients, did not reappear. The dose was from one to two grammes, either given altogether or in separate doses shortly before the paroxysm; correspondingly smaller doses being given to children. At first it was given as a powder, but later in warm water and glycerine, namely, two parts of acid to 200 of boiling water, and sufficient glycerine to effect the solution. The mixture was warmed each time before it was taken. A good deal of discussion ensued upon the mode of administration, most speakers considering the forms of powder or emulsion undesirable, while the quantity of water required, on account of the great insolubility of the acid, was also objectionable. Glycerine was generally recommended, and it was stated that fifty parts of this and fifty of water constituted a vehicle that held the acid in permanent solution.

The Spoon in Medicine. — The lack of accuracy in the very common prescription of a "spoonful" of medicine for a patient received a striking rebuke in Exeter, England, the other day. A female infant, nineteen days old, died there under conditions that suggested poison as the cause. There was an inquest, and the cause of death was returned in the coroner's certificate in the following manner: "Congestion of the lungs, accelerated by an overdose of opium, innocently administered by her mother from a modern teaspoon containing two drachms, instead of from a teaspoon of older date, containing one drachm." It is well known that the teaspoon and tablespoon of the present day are of very indefinite capacity, and may, moreover, be said to average nearly double the size of those in vogue little more than a quarter of a century ago. The spoon should, therefore, never be used in prescribing doses, unless the physician knows the size of the one that will be used. It is a pity that graduated medicine glasses are not articles of common household use. They are not costly, and no family should be without one.

Waxed Paper as a Substitute for Lint and Oiled Silk. — Dr. Dyce Duckworth, of St. Bartholomew's Hospital, London, when using ointments for the cure of disease or abrasions of the skin applies them on waxed paper instead of lint. This is the material used by pharmacists for covering gallipots, etc.; it consists simply of thin tissue-paper dipped in melted wax. A piece of this is cut of a size sufficient to extend beyond the margins of the sore place; the ointment suitable to the case is smeared on the centre, not too thickly, and it is then carefully adapted to the affected part. It is adhesive, so that there is no necessity for strapping or bandaging; it is very cheap, and it is cooler than lint. Dr. Duckworth uses it even for extensive eczema of the limbs.

Inhalation of Ipecacuanha. — Dr. Murrell, in *La France Médicale*, advises the inhalation of ipecacuanha in the treatment of bronchitis when there is dyspnœa. He claims that its use in this way in winter cough has been remarkably successful. He employs the wine, usually with from one to two parts of water, and administers daily from half a drachm to a drachm of the preparation.

SELECT FORMULÆ.

For Burns. — The *Journal of Pharmacy* gives the following as a new and effective mixture for burns: Break fifteen ounces of the best white glue (extra) into small pieces, add to it two pints cold water, and allow it to become soft. Then melt it on a water bath, add to it two fluid ounces glycerine and six drachms carbolic acid, and continue the heat on the water bath until a glossy, tough skin begins to form over the surface in the intervals of stirring. The mixture may be used at once, after the glue is melted and the glycerine and carbolic acid are added; but when time allows, it is advisable to get rid of a little more of the water, until the proper point is reached. On cooling, this mixture hardens to an elastic mass, covered with a shining, parchment-like skin, and may be kept for any time. When using it, it is placed for a few minutes on the water bath, until sufficiently liquid for application (it should be quite fluid). Should it at any time require too high a heat to become fluid, this may be corrected by adding a little water. It is applied by means of a broad brush, and forms in about two minutes a shining, smooth, flexible, and nearly transparent skin. It may be kept for any time in delf or earthen dishes or pots turned upside down.

Ginger Beer Powders. — The London *Chemist and Druggist* says that a powder for making ginger beer, to be sold in single packets, may be prepared thus: —

Ginger, bruised	½ oz.
Cream of tartar	¾ oz.
Ess. lemon	4 drops.

Mix. Some sugar may be added if it be thought desirable to make the packet look bigger. For use this powder is to be added to a gallon of boiling water, in which dissolve 1 lb. of lump sugar, and when the mixture is nearly cool two or three tablespoonfuls of yeast are to be added. The mixture should be set aside to work for four days, when it may be strained and bottled.

Cold Cream with Borax. — The following formula is given by the same journal in answer to an inquiry from a correspondent: —

White wax	1 oz.
Oil almonds	4 ozs.
Rose water	2 ozs.
Borax	½ dr.
Otto of Rose	5 drops.

Dissolve the borax in the rose water and (by the aid of heat) the wax in the oil. While still warm, mix gradually in a mortar, previously warmed. Add the otto, stirring constantly.

CINCHO-QUININE.

Dr. James Eugene Bell, of Anthony Shoals, Elbert County, Georgia, writes, October 8, 1875: —

"After repeated trials, I regard Cincho-Quinine as nearly if not quite equal to sulphate of quinine, weight for weight."

Dr. J. A. B. Sikes, of Steam Mill, Decatur County, Georgia, writes, September 30, 1875: —

"I have used Cincho-Quinine in several cases of fever and ague, with the very best results, and have given it to children, who could not take sulphate of quinine, with fine success. I intend never to be without it."

The following are a few other recent testimonials from physicians: —

Jonesville, Mich., *September* 17, 1875.

I take pleasure in bearing testimony to the efficacy of Cincho-Quinine.

In my opinion its manufacturers have not overrated its virtues. H. M. Warren, M. D.

Independence, Texas, *September* 20, 1875.

I have tested Cincho-Quinine in a number of cases of bilious, remittent, and intermittent fevers, and neuralgia, and find it perfectly reliable as an antiperiodic. It does not produce the objectionable effects of sulphate of quinine, and I believe it will eventually supersede that medicine.

A. M. Knight, M. D.

Jackson, Mich., *September* 16, 1875.

I have used Cincho-Quinine about five years, and know it to be very efficient; prefer it to the sulphate in cases of children.

Jno. D. North, M. D.

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Boston Journal of Chemistry.

VOLUME X. BOSTON, DECEMBER, 1875. NUMBER 6.

Familiar Science.

A LEAD PENCIL.

THE very name of the lead pencil, like so many others that have become familiar as household words, is a misnomer, for there is no lead in it. Red lead is an oxide of lead, and white lead is a carbonate of the same metal, but black lead is neither a metal nor a compound of a metal. It is, as most of our readers are aware, one of the forms of that very common but very interesting element, carbon; and is also known as plumbago and as graphite. The former name is derived from the Latin *plumbum* (lead); the latter, from the Greek γράφειν (*graphein*, to write), is a more appropriate and descriptive appellation.

If science had not demonstrated the fact, we could hardly believe that the transparent diamond is identical in chemical constitution with graphite, from which in outward appearance it differs so widely. They are as different in their other properties as in their color. Both are found in a crystalline form, but the diamond crystals are octahedral, while those of graphite are hexagonal plates, or very short six-sided prisms. The average specific gravity of the diamond is 3.5, that of graphite ranges from 1.8 to 2.1. The former is a very poor conductor of electricity; the latter is so good a conductor that it is used in the electrotype process to form a conductive surface for wood, wax, and other non-conducting bodies. Again, the diamond is the hardest of substances, while a mass of graphite is easily cut with a knife, and in powder it is so soft and unctuous that it is used as a lubricant for diminishing the friction of machinery. The minute particles of this powder, however, are extremely hard, and saws employed for cutting masses of graphite wear out rapidly. Professor W. Mattieu Williams has so graphically stated this peculiarity of graphite, that we cannot refrain from quoting a part of the passage: —

"I may venture to describe it as the softest of all true solids, and have often pondered wonderingly upon the apparently unnoticed but very curious chemico-mechanical paradox that the hardest and softest of all the solids existing upon this earth are, chemically speaking, the same substance: graphite and the diamond being both carbon. It is this wonderful softness, combined with persistent solidity, that enables us to smear it over any other solid surface, and thus obtain a solid paint, all body and no medium. For the class of castings to which it is commonly applied, where its application can be readily repeated, and where it is not exposed to the direct action of water, it is unrivalled as a protecting film to iron. Its chemical action, so far as it does act when cold, is reducing or anti-oxidizing. Its color and tone are so similar to iron that Mr. Ruskin himself could scarcely make any æsthetic objections to its use, and the film is so marvellously thin that it obliterates nothing. I have never met with any attempt to estimate the thickness of a well brushed film of graphite, but I suspect that, if a hundred strata of such films could be piled in contact with each other, their combined thickness would fall short of that of the thinnest gold-leaf."

As found in nature graphite is never perfectly pure, but contains at least a small percentage of iron, manganese, and other substances. It was formerly sometimes considered to be a compound of carbon and iron (a so-called "carbide of iron"), but it is now known that the iron is merely mixed, not chemically combined with it. Even the diamond is not pure carbon, but leaves, when burned, a minute proportion of ash in which oxide of iron and silica have been detected.

Graphite is a comparatively rare though widely distributed mineral. The oldest and most famous mine is in Cumberland, England, but there are other deposits in Siberia, in Ceylon, and in various parts of this country; as at Brandon, Vt., Ticonderoga, N. Y., and Wake County, N. C. There is a valuable mine of it at Sturbridge in Massachusetts, which has been worked for thirty-five years or more.

The Cumberland mine is at Borrowdale, a few miles from Keswick, and has been known from the time of Elizabeth. It is probable that it furnished the material for the first lead pencils ever made, and it has always been celebrated for the fine quality of graphite that it yielded. Its wealth was so tempting that it was sometimes plundered by the rude people of the district, and a special act of Parliament was passed in 1752, authorizing the employment of an armed force for its protection, and imposing heavy penalties upon any one convicted of robbing it. A strong building was erected over the entrance of the mine, and the men employed were carefully searched on leaving work. In 1778, the product was nearly 30,000 pounds of the best quality of graphite, the value of which was £45,000 or $225,000. In 1804, when the price of the mineral was 35 shillings ($8.75) a pound, the net profits exceeded half a million of dollars. To avoid overstocking the market and exhausting the limited supply too soon, the mine was worked only for six weeks each summer, and it was sometimes closed entirely for several years in succession, the current of a mountain stream being turned so as to flood it. But the finer quality of graphite gave out long ago, and the coarser varieties being exhausted in their turn, the workings were at length abandoned. We see, however, by English journals which have just come to hand, that after a lapse of several years operations are to be resumed at this ancient mine. A "find" has been made which promises to rival both in quantity and in quality the former yield. The masses of mineral are of extraordinary size, in one instance reaching the weight of 40 pounds. Generally they have not been larger than a man's fist, though lumps have now and then been found that weighed even 50 pounds.

There are several pencil manufactories in Keswick, one of which we had the pleasure of visiting when last in England. The "leads" for the best pencils, as we were told, were formerly sawed out from masses of the pure graphite then yielded by the Borrowdale mine; but the only mine now furnishing masses large enough for the purpose is in Siberia. Perhaps the new "find" at Borrowdale may supply the Keswick makers once more with this superior kind of material. At present the smaller fragments of graphite are ground fine, calcined, and mixed with pure clay, which has been prepared by diffusing it through water, allowing the coarser particles to settle, drawing off the milky liquid from the top, and letting it settle again. This latter sediment is exceedingly fine and plastic, and after being dried on linen filters is fit for use. It is mixed with the powdered graphite in various proportions, according to the degree of hardness required in the pencil; two parts of clay to one of graphite being used for a fine hard grade, equal parts for a soft one, and intermediate mixtures for the grades between. The materials after being mixed are triturated or kneaded with water till they are of the consistency of dough. This dough is pressed into grooves in a smooth board, dried in this mould by a moderate heat, then taken out and baked in covered crucibles in a furnace. Sometimes the dough is compressed in a strong receiver and forced out through a small hole in a thread of the shape required, then dried and baked as above. The grade of the lead depends partly upon the degree of heat to which it is exposed in the furnace. Leads intended for very fine work, like architectural drawing, are reheated after the baking, and immersed in melted wax or suet.

The wood used for all the better kinds of pencils is the Florida red cedar, which is thoroughly seasoned, cut into strips, dried again, and then cut into pieces of proper size for pencils. These are grooved by machinery, the leads are glued into the groove, and the other half of the wood is glued on. After being dried under pressure they are rounded or otherwise shaped by a kind of lathe or cutting machine; then polished by another machine, and sometimes painted or varnished by a third, which feeds the pencils from a hopper and turns them round under the brush. At Keswick the best pencils never go through this latter process, but are finished by simple polishing. They are next cut the right length by a circular saw, and the ends made smooth by a drop knife, after which they are stamped with a heated die and sent to the packing room.

The small leads for "ever-pointed" pencils are made either from the natural masses of graphite or from a composition of graphite and clay prepared as already described, and baked. Sometimes the powdered graphite is solidified by hydraulic presses of enormous power. The masses,

whether natural or artificial, are sawed into small prisms, which are reduced and rounded by forcing them through a series of holes cut in pieces of ruby. The rubies employed wear out in a few days, and steel is said to last but a few hours. The cheaper grades of leads are made by less expensive processes, which we have not space to describe.

Lyell, in his "Geology," remarks that the compressing of powdered graphite into a mass as dense and compact as the native mineral by hydraulic pressure may help us to comprehend how fine sediment, derived from the detritus of rocks, has become consolidated by the weight of other materials successively heaped upon it.

We have said that a lead pencil contains no lead, but there is one exception to the statement. The hardest grades of pencils used for architectural drawing have sometimes been made of an alloy of lead, antimony, and mercury. The poorest kind of pencils and those for carpenters' use are made of powdered graphite mixed with melted sulphur, sometimes with gum or resin, and cast in moulds. The wood used for some of these very cheap pencils is white pine.

A NEW APPLICATION OF THE SPECTROSCOPE.

THERE is apparently no limit to the achievements of that marvellous instrument, the spectroscope. It can compel suns and stars to yield up the secrets of their physical and chemical constitution, and it can detect a minute adulteration in a phial of medicine. It can analyze rays of light too faint to be discerned except with the aid of the most powerful telescopes, and coming from distances so vast that it has taken years for them to reach our earth; and it can compel a grain of salt dissolved in a hogshead of water to declare its presence by luminous characters that cannot be misinterpreted. One of its latest applications has probably been the means of settling a disputed question which it would have been difficult, if not absolutely impossible, to determine conclusively in any other way. Do insectivorous plants really digest the insects they entrap? Darwin has endeavored to prove that they do; but notwithstanding the array of facts he has presented in his recent book on the subject, he has failed to convince certain botanists, who still maintain that the dead insects undergo decomposition, but are not actually assimilated by the leaves. Professor Morren has recently advocated this view with much learning and ability, after a careful investigation of all the phenomena.

It occurred to Mr. J. W. Clark, of England, that the spectroscope might be employed in the examination of this matter. He therefore obtained a number of plants of *Drosera rotundifolia* and *Pinguicula lusitanica*, and fed the leaves with the bodies of freshly-killed flies soaked in citrate of lithium. He took all necessary precautions to prevent the solution from being carried mechanically to other parts of the plant. After an interval of about forty-eight hours, various portions of the plant were reduced to ashes and tested for lithium with the spectroscope. The colored lines characteristic of that metal at once flashed forth, proving that the products of digestion, after absorption by the leaves, do enter the leaf-stalk, and are thence distributed to other parts of the plant.

If the experiments made by Mr. Clark, and reported by him in full in the London *Journal of Botany* for September, were conducted as carefully as he represents, the results obtained admit of no different interpretation. Other investigators will of course repeat his experiments, and his conclusions will soon be confirmed or contradicted. If the spectroscope has not already put an end to the dispute, we may be sure that it will soon do so.

A MAGNIFICENT LABORATORY.

THE Duke of Devonshire has presented to the Cambridge University (of which he is Chancellor) a new Physical Laboratory, which for extent and completeness is unsurpassed, and probably unequalled, by any other laboratory in the world. It is under the direction of Professor Clerk Maxwell, and though not fully fitted up is already open for students. We find a minute description of the building in *The Academy*, of which the following is a condensation: —

The building is an exceedingly handsome one, constructed of a yellow freestone much used in Cambridge. In the vestibule is the lavatory, passing which, and turning to the left, we find ourselves in the unpacking room, a few feet below the level of the street and communicating with it by an inclined plane, down which heavy cases can be wheeled. At one side is a lift arranged with counterweights for raising apparatus to the museum room above, Adjoining the unpacking room is the workshop, where stands one of Whitworth's best lathes with self-acting motions, American drill-chucks, dividing plates, and many other wonderful things. The apparatus is, as well as the laboratory, the gift of the Chancellor, who, moreover, being a scientific man himself, and knowing the amount of thought required for contriving instruments, has made his gift doubly valuable by allowing two years in which to buy the standard apparatus, so that nothing need be ordered in a hurry or until elaborate experiments have been made as to the best form of each piece of apparatus.

Beyond the workshop is the battery room, which is situated under the lecture room, with which it is connected by various trap-doors, wires, pipes, etc. It contains beside the batteries a big receiver for oxygen gas. In the weighing and measuring room stand balances by Oertling, in which if a piece of paper be counterpoised a light ink mark made on it an eighth of an inch in length will turn the scale, caliper gauges by Elliot which measure to the thousandth of an inch, etc.

Now we must deposit our knives, keys, and any other iron which may be about us, for we are coming to the long range of magnetic rooms where magnets curiously suspended by silk fibres are having their positions read by means of all the refinements in telescopes, scales, and circles of which modern instrumental science is capable. Here all the hot-water pipes are made of copper, that their expansion and contraction may not affect the instruments. Iron bolts, however, are freely used in the ceiling, and in other places away from the apparatus, for it is only moving iron that affects the work. In the last of these rooms is a stone table, on which stands the great electro-dynamometer, the property of the British Association. There is also a stone slab, on which the horizontal force magnetometer is placed. The slab and the stone table are each bedded in deep concrete to insure steadiness.

Returning to the vestibule we go up the staircase with its beautiful carved oak balustrade, and arrive at the first floor. On the right is the lecture room, perhaps the handsomest room of its kind in England, containing seats for about 150 students. The table runs across the room, and is supported on a wall quite independently of the floor. It is excellently lighted, but if we turn a winch in the wall we see all the shutters slowly closing at once till we are left in complete darkness. Behind the lecture room and opening into it is the preparation room, where apparatus can be got ready for lecture; beyond this is the museum room, where all the apparatus not in use will be displayed in glass cases. The lift from the unpacking room below enables instruments to be placed here without the shaking which is unavoidable when heavy things are carried up a staircase. Passing through the museum we come to Professor Maxwell's private room, where stands the Thomson electrometer, to describe all the details of which would alone take a small volume. We next find ourselves in the general laboratory, a lofty room sixty feet by thirty, and containing twelve large tables. Here is the Bramah press, by means of which a pressure or strain which is indicated on the gauge as three tons per square inch can be applied. Here also are all the British Association standard units of resistance, a comparison of which with one another to see if they have varied since they were made in 1864 is now in progress. Here also are the bridge resistance coils, and galvanometers of the same kind as those by which the position of a fault, say in the Atlantic cable a thousand miles from land, can be determined within a few yards; they are, however, used for other purposes here, chiefly for the determination of the electrical constants of other instruments in absolute measure. The tables stand on blocks set in holes in the floor, and these pass through to beams which support the tables independently of the floor. There are trap-doors in the floor and ceiling in every direction, each in the ceiling being exactly over one in the floor, so that wires, say for torsion experiments, can be hung from the roof to the basement of the building.

Going up-stairs to the second floor, and turning to the left, we first come to the electrical room, where stand electrical machines and Leyden jars of all kinds. This room is to have an artificially dried atmosphere, produced by an endless band of flannel constantly revolving over two rollers, one in the room and the other kept heated by gas and placed in the chimney. A trap-door in the wall opens into the lecture room, so that wires can be carried from the electrical machines to the lecture-table.

There is also here a dark room for photographic purposes. In another part of the room is a little window, so placed that a heliostat set on the ledge outside will send a beam of sunlight down the whole length of the neighboring passage. Opening from this passage are five small rooms, chiefly intended to be used as private rooms for advanced students. In one, the optical bench stands; in another, experiments on polarized light are conducted; in a third is the spectroscope. Going up-stairs again, we come to a room situated in the roof of the lecture room, from traps in the floor of which Foucault's pendulum, spheres for electrification, diagrams, etc., can be suspended. There is also another room called the mercury room, where is to be the upper end of a pipe (not yet constructed) reaching to the basement of the building, for compressing gases, etc., under a column of mercury of considerable height.

On the roof above is to be a mast with a conductor for collecting atmospheric electricity.

A SUICIDAL STAR-FISH.

MR. P. H. GOSSE, in one of his popular books on zoölogy, describes a star-fish, about two feet in diameter, which has "an unhappy tendency to suicide," — unhappy for the naturalist who wants to secure the creature for his cabinet, for its motto evidently is "Liberty, or death." Pro-

fessor Forbes gives the following account of his vain attempts to capture one : —

"The first time I ever took one of these creatures I succeeded in getting it into the boat entire. Never having seen one before, and quite unconscious of its suicidal propensity, I spread it out on a rowing-bench, the better to admire its form and color. On attempting to remove it for preservation, to my horror and disappointment I found only an assemblage of rejected members. My conservative endeavors were all neutralized by its destructive exertions, and it is now badly represented in my cabinet by an armless disk and a diskless arm. Next time I went to dredge on the same spot, determined not to be cheated out of a specimen in such a way a second time. I brought with me a bucket of fresh cold water, to which article star-fishes have a great antipathy. As I expected, a *Luidia* came up in the dredge — a most gorgeous specimen. As it does not generally break up before it is raised above the surface of the sea, cautiously and anxiously I sunk my bucket to a level with the dredge's mouth, and proceeded in the most gentle manner to introduce *Luidia* to the purer element. Whether the cold water was too much for him, or the sight of the bucket too terrific, I know not; but in a moment he proceeded to dissolve his corporation, and at every mesh of the dredge his fragments were seen escaping. In despair I grasped at the largest, and brought up the extremity of an arm with its terminating eye, the spinous eyelid of which opened and closed with something exceedingly like a wink of derision."

FIRING GUNS BY ELECTRICITY.

The system of firing guns by electricity while proving them, which is now in vogue in England, and which was employed in the case of the 81-ton gun, was adopted in 1856, up to which time the guns had been fired by fixing a piece of portfire over the vent by means of clay, igniting it, and then running under cover. The application of electricity was brought about by a curious accident. A number of guns were being proved in this way in the Royal Arsenal at Woolwich, and were placed for this purpose in a row on skids in front of the butts. The ignited portfires did not all burn at the same rate, and the result was that one gun went off before the others. This gun unfortunately burst, and one of the fragments, striking a neighboring gun, swung it round with its muzzle towards the arsenal, but without displacing the piece of ignited portfire over the vent. In due time the portfire fired the charge, and the gun projected its shot over the arsenal and town of Woolwich into the dockyard, where it fell, happily without doing any injury. This was in 1852, and another similar accident was narrowly escaped in 1855, when a mortar which was undergoing proof was swung round in the same way, but, fortunately, not until after it had discharged itself. Mr. M'Kinlay, the proof-master, was led by these circumstances to contrive a mode of firing guns by electricity. This he successfully accomplished in 1856, when the "galvanic tube" was introduced. In this tube a steel or platinum wire is embedded in a charge of powder, and this wire forms a link in the circuit of a galvanic battery. The retardation of the current, due to the inferior conducting power of the steel or platinum wire, causes it to be raised to a red heat, and by this means the powder is exploded. This system was in use until 1862, when the Abel "electric tube" was invented. In this the steel wire is replaced by a priming charge, consisting of subphosphide and subsulphide of copper, with a little chlorate of potash, and in this composition the terminals of the two insulated copper wires that conduct the electric current are embedded. The points of the wires are about one sixteenth of an inch apart, and when the current is sent along the wires it is sufficiently retarded by the separation of the wires and sufficiently accelerated by the sensitive composition to pass from one wire to the other in the form of a spark, by which means the tube is exploded. A magneto-electrical machine, specially designed for this purpose, is used for exploding the tube in preference to the galvanic battery, though any other electric agency could of course be used in doing it.

NATURAL HISTORY NOTES.

An Ant Shop in Paris. — The ingenuity of purveyors for the Paris market is infinite, and the products of the animal, vegetable, and mineral kingdoms have been worked upon by industrious inventors until it seemed hardly possible to utilize any one of them by any fresh process. Nevertheless a new use for some thing or creature hitherto deemed useless is constantly being reported from the metropolis of the versatile nation. One of the last species of industry discovered is recorded in the *Soir* newspaper. This is the breeding of that insect which is usually considered interesting only as the subject of moralist fables — the industrious but not altogether friendly ant. A young lady, more practically philosophic than Æsop or La Fontaine, has actually started an establishment for the preservation and propagation of the ant species in France. The fair mistress of the institution is described as of rather "terrible" aspect. Although clad in a suit of buff, like the female archers of olden time, she is not completely guarded against the attacks of her ungracious *protégés*, who have managed to bite her face and hands until they are tanned to the texture of parchment. The consequence of these continual attacks has, so the *Soir* affirms, been to render her skin insensible to the most furious assailant. She lives day and night in the midst of her numerous wards, and employs large numbers of emissaries to collect fresh sacks of them from the great forests in or near France. It is not, of course, a mere disinterested affection which has suggested to her these strange proceedings. She keeps only the ants which are "good layers," and sells their eggs at a high profit to the breeders of pheasants, whose taste for that article of food amounts almost to a madness. Until lately human ingenuity has been more usually exercised in inventing methods for the destruction of ants. But as we grow wiser we grow more humane. The police of Paris have removed the ant-house of the inventress to a respectful distance from the town. But she has already established her reputation and a custom which bids fair to make her fortune.

The Tiger the True King of Beasts. — Dr. Haughton, referring to the statements made by Dr. Fayrer in his book on "The Royal Tiger," sustains the assertion of that author that the tiger is stronger than the lion. In fact, he says he has proved in his "Animal Mechanics" that the strength of the lion in the fore limbs is only 69.9 per cent. of the tiger's, and that the strength of the hind legs is only 65.9 per cent. of that of the tiger. He also declares that the lion is a "pretentious humbug, and owes his reputation to his imposing mane, and he will run away like a whipped cur under circumstances in which the tiger will boldly attack and kill."

Insects that Decline to be Eaten by Carnivorous Plants. — It appears that there are insects which defy the traps of carnivorous plants. They venture boldly into the very jaws of the enemy, and eat instead of being eaten. In a recent number of the *Transactions of the Academy of Science of St. Louis*, Mr. Charles Riley describes the curious habits of two insects which are found alive in the pitchers of *Sarracenia variolaris*. The first is a small moth, *Xanthoptera semicrocea*, which lays its eggs within the pitcher. The young caterpillars there weave a gossamer-like web and feed on the cellular tissue of the leaf. The second is a dipterous insect, *Sarcophaga sarracenia*. The mature fly is stated to drop a number of the larvæ into the pitcher, where they feed on the decaying remains of other insects, and finally burrow through the bottom of the pitcher into the ground, where they undergo their transformations.

HINTS FOR EXPERIMENTS.

An Optical Experiment. — Professor F. E. Nipher sends to *Nature* the following pretty optical experiment Observe a white cloud through a plate of red glass with one eye, and through green glass with the other eye. After some moments transfer both eyes to the red glass, opening and closing each eye alternately. The strengthening of the red color in the eye, fatigued by its complementary green, is very striking. The explanation of the phenomenon is of course well known, and many modifications of the experiment will readily suggest themselves.

The Cobalt Hygrometer. — We have already referred to this simple contrivance, which teachers will find useful for illustrating the influence of atmospheric moisture on a chemical reaction. Unsized paper, as thin blotting or filtering paper, is to be dipped into a solution of chloride of cobalt, common salt, and a little gum arabic. It is red at first, but while drying becomes more pink, bluish-red, and finally blue when quite dry. As the paper thus prepared is slightly hygroscopic it will easily attract atmospheric moisture, and be colored more or less reddish in proportion as it finds more moisture to attract. The *Manufacturer and Builder* suggests that if it is to be used in very dry climates, as in some of our Western regions, a very little glycerine or chloride of lime may perhaps be added to the solution, when it will be more capable of indicating the differences in moisture in comparatively dryer kinds of air. A good addition to this arrangement is a disk painted with half a dozen or more shades of red and blue for comparison, as enumerated below, which shades may then be marked thus : —

Rose-red,	Pink,	Bluish-pink,	Lavender,	Violet,	Blue,
Rain.	Very moist.	Moist.	Middling.	Dry.	Very dry.

Illustration of the Laws of Falling Bodies. — In a German journal Herr Waldner, of Strasbourg, describes some new methods of illustrating the laws of falling bodies. In one of these a small metallic ball is suspended by a string, and under it, at a distance which we will call 1, are a pair of metallic balls connected with the poles of an electric machine, and so far apart that no spark can pass, but so near that through the fall of the suspended ball between them a spark will pass. Vertically under this pair are several other pairs, similarly arranged, at distances of 4, 9, 16, etc., all connected with the electric machine, and in the same circuit. On burning the thread of the suspended ball, this falls between the others under it, giving passage, at each pair, to the current; and a simultaneous spark in another part of the circuit makes a mark, for each pair of balls, on a rotating blackened cylinder or disk. The intervals between the marks are found to be equal.

Experiment in Vibration. — Place a glass tumbler, filled with water to about half an inch from the top, on a table, holding the glass to the table with the left hand, and, using a common fine-grained tobacco pipe for a bow (taking the bowl of the pipe between the finger and thumb), draw the stem briskly and evenly with only downward strokes on the edge of the glass, causing the water to vibrate. This continuous vibration elevates the water in the centre of the glass into the shape of an inverted cone (like a convolvulus flower), diffusing it by centrifugal force for some distance round the glass, where it falls in a circular shower of dew or mist.

Practical Chemistry and the Arts.

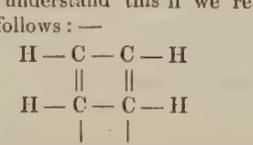
COAL TAR.

The old alchemist sought long and faithfully for the means to transform the baser metals into gold, but without success. Modern chemists have attempted far more wonderful things, and succeeded in them. Bolton little dreamed that the dark, ill-smelling, viscid substance which obstructed the pipes of his gas-works was to become a mine of wealth to future generations, and that in less than seventy-five years more chemists would be at work upon it and the various substances produced from it, than were employed at all other branches of chemical knowledge. It is impossible to pick up a paper which treats of scientific subjects, at the present time, without finding some reference to this wonderful substance. Nor is it confined to the chemist's laboratory, but its products are found in every drug store, if not in every household; so that we might almost say that this is an age of coal tar.

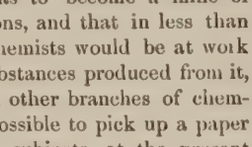
It is only a few years since painting fences was considered to be about as good a use as coal tar could be applied to. It did not make a very good paint, and it smelled rather badly, but it was cheap. Professor Faraday was the first to make a discovery of much importance in relation to any of the substances contained in it. It seems that about fifty years ago a company was formed in London for supplying the citizens with oil gas. This was condensed in cylinders, very similar to the cylinders used to hold gas for lighting the cars on some of the railroads at the present time; and these cylinders were carried round and delivered to customers, as soda-water fountains now are. The owners were very much annoyed in cold weather by a solid white crystalline substance collecting in the cylinders, and even stopping up the pipes. They called upon Professor Faraday to investigate this, and he found that it was a new substance containing carbon and hydrogen, which he called the bicarbide of hydrogen. It may also be procured by heating benzoic acid with hydrate of lime, whence it has received the name of benzole. Further research showed that benzole might also be obtained from coal tar, and with this discovery coal tar may be said to have started on its career of usefulness. When coal tar is distilled in suitable vessels the first product passing over is an oily liquid, which contains benzole mixed with certain other bodies which have a very similar composition. These are as follows, their formulas being also given, in order that their close relations may be seen: —

Benzole . .	C_6H_6	
Toluole .	C_7H_8	or $C_6H_6 + CH_2$
Xylole . .	C_8H_{10}	or $C_6H_6 + 2CH_2$
Cumole .	C_9H_{12}	or $C_6H_6 + 3CH_2$
Cymole . .	$C_{10}H_{14}$	or $C_6H_6 + 4CH_2$

Benzole is largely used in the arts as a solvent for india-rubber and gutta-percha. Care must be taken to distinguish this body from naphtha, or petroleum benzine, as it is often called. Benzole is quite frequently called coal tar naphtha or coal tar benzine. This makes considerable confusion in regard to the two articles, but they are in reality very distinct. Benzine will not dissolve gutta-percha, benzole will. Benzole has rather a fragrant odor, while benzine has an odor that is somewhat suggestive of onions. One of the most remarkable things about benzole is the readiness with which it enters into combinations with other bodies. It may help us to understand this if we represent its composition as follows: —



It will be observed that each atom of carbon is joined to two other atoms of carbon and one atom of hydrogen. Now we can take away each atom of this hydrogen in turn, provided we supply its place by something else without disturbing the arrangement of the carbon atoms. The molecule NO_2 will replace H exactly, and if we dissolve benzole in strong nitric acid, and then add water, a body separates out whose formula may be represented thus: —



This body is known as nitrobenzole, *essence de mirbane*, or artificial oil of bitter almonds. This latter name it derives from its smell, which somewhat resembles that of the true oil of bitter almonds. It is largely used for the purpose of perfuming soap, and to some extent in cheap confectionery. It is, however, totally unfit for use in anything destined for food, as it is very poisonous. A second atom of hydrogen may also be replaced by NO_2, forming dinitrobenzole, a substance which has not been applied to any use as yet.

Toluole, the next term of the series, is produced by distilling tolu balsam. Xylole has attracted some attention as a remedy for small-pox. Cumole and cymole are mainly interesting from a theoretical point of view.

If nitrobenzole is distilled with iron filings and acetic acid it loses all its oxygen and takes up two atoms of hydrogen in place of the oxygen, giving a body with the formula C_6H_7N. This is aniline, or aniline oil, as it is often called. Aniline was first obtained from indigo, from which it takes its name, the name of the indigo plant being *Indigofera anil*. It is also found to some extent already formed in coal tar. Aniline, it is hardly necessary to say, is very extensively used in the arts as the basis of the beautiful coal-tar colors. Aniline mauve is prepared by oxidizing aniline with bichromate of potash and sulphuric acid. Rosaniline is produced by oxidizing aniline with arsenic acid, mercuric oxide, and various other substances; but the aniline, to produce it, must not be pure, but must contain toluidine. Aniline blue and violet are formed by digesting aniline red with an excess of aniline. The variety of shades which may be produced from aniline seems to be almost endless.

After the light oils, as the above series is called, are distilled from coal tar, the next product is that known as the heavy oils or dead oil. This is a disagreeable-smelling compound, and is in fact the substance to which coal tar owes much of its odor. It is used to a considerable extent for preserving timber, the wood being dipped into the hot oil. If the substance is treated with a hot concentrated solution of caustic potash and allowed to stand, and afterwards mixed with water, the fluid separates into two portions, an oily and an alkaline liquid. This latter is drawn off and treated with hydrochloric acid, which separates an oil. This oil is impure carbolic acid, which has a peculiar odor and an extremely burning taste, and in the concentrated state is a violent poison. Rightly used, however, it is one of the greatest gifts which modern chemistry has made to medicine. But chemistry has lately made another advance. She has taken this strong-smelling corrosive liquid and transformed it into an odorless compound, which is not poisonous but which retains most if not all of the good qualities of the carbolic acid. This is salicylic acid.

But carbolic acid, whose formula is C_6H_5O,H, may be acted upon by nitric acid, and three of the hydrogen atoms taken out and replaced by three molecules of NO_2 to form picric acid, which is extensively used to dye yellow on wool. Picric acid forms with the alkalies salts that are extremely explosive.

Cresylic acid, C_7H_7OH, accompanies carbolic acid in coal tar and generally exists together with carbolic acid, or phenol, as many prefer to call it, in commercial carbolic acid. After the carbolic acid has been distilled another body begins to pass over, called naphthalene, and having the formula $C_{10}H_8$. This is a beautiful white crystalline body, which is used to produce some elegant dye-stuffs.

The last product which passes over is a mixture of anthracene and chrysene. We spoke last month of the use of anthracene in making artificial alizarine. The residue that is left in the retort is used as a cement for roofing purposes, and also for making sidewalks. So we see that the once despised coal tar has, in the hands of the chemists, become one of the most useful as well as one of the most interesting substances known to modern science; and it has been promoted from doing menial service as a doubtful beautifier of fences, to serve in the houses of the most wealthy, where it is universally admired for the beauty, and we wish we could say the permanency, of its tints. But the colors have improved much in this last respect since they were first discovered, and we may reasonably hope that some method will be found of making them permanent. The anthracene or artificial alizarine colors are almost if not quite as permanent as those derived from madder, and these furnish beautiful shades of red, purple, chocolate, and violet, according to the mordants used.

With the list we have given we have by no means exhausted the substances found in coal tar. There are many others, though only in small amounts; and as for the substitution compounds formed from these and the ones already described, they are endless. New ones are being described daily, and all the journals are filled with their terrible names. S.

NEW THINGS IN THE ARTS.

Imitation Leather. — At the "Maritime Exhibition" now open in Paris, an imitation leather is shown which seems to be vastly superior to any article of the kind before known. It is called *cuir-liège*, and is a preparation of cork. Cut in fine sheets, or in strips, and covered on either side with a skin of india-rubber, it wholly loses its friability, while keeping every advantage. Cork thus treated may be wrung out like a dishcloth, doubled into any shape, and beaten with a mallet, but suffers actually no damage. It is, of course, perfectly watertight, and the inventor shows buckets of every size which fold like a handkerchief to put away. Some on view have been full of water ever since the opening of the exhibition. But the *cuir-liège* claims to be also heat-proof, a quality that should make it invaluable for ambulance tents, for awnings, and for tropical use. It may in short be said that every purpose served by leather professes to be fulfilled in this new substance, with the further recommendation of great lightness and impermeability. Its strength is such that a strap an inch and a half wide has been holding a 1000 lb. weight for more than six weeks. In thicker sheets, veneered with fancy woods, it is suggested as a material for carriage-building. Most elegant boots made of it are shown, as well as portmanteaus and hats. In soldiers' equipment, it is claimed that knapsack, straps, belts, cartouch-box, etc., can be lightened by 70 per cent., and at the same time be made waterproof and heat-proof, strengthened, and diminished in cost by 25 per cent. at least.

A New Use for Corn-Cobs. — In France, corncobs have of late been extensively used for firelighters. They are steeped in hot water containing 2 per cent. of saltpetre, and after being dried at a high temperature are saturated with 50 per cent.

of resinous matter. These lighters, which are sold at from $2.50 to $4.00 the thousand, are employed with advantage and economy in private houses and for lighting furnaces. By others the cobs are immersed in a mixture of 60 parts of melted resin and 40 parts of tar, after which they are taken out and allowed to dry. They are then subjected to a second operation, which consists in spreading them out on a metallic plate heated to 212° F. They are finally assorted according to size, and tied up in bundles, and sold at the rate of three or four for a cent. The establishment in Paris (La Société des Allumettes Landaises) for manufacturing them employs 30 workmen, and effects sales to the amount of $40,000 annually.

A Remarkable Clock. — A marvellous piece of mechanism has just been exhibited in Paris. It is an eight-day clock, which chimes the quarters, plays sixteen tunes, playing three tunes every twelve hours, or at any intervals required. The hands go round as follows: one, once a minute; one, once an hour; one, once a week; one, once a month; one, once a year. It shows the moon's age, the rising and setting of the sun, the time of high and low water, half ebb and half flood, and by a beautiful contrivance there is a part that represents the water, which rises and falls, lifting some ships at high-water tide as if they were in motion, and, as it recedes, leaving these automaton ships dry on the sands. The clock shows the hour of the day, day of the week, day of the month, month of the year, and in the day of the month there is a provision made for the long and short months. It shows the signs of the zodiac; it strikes or not, chimes or not, as may be desired; and it has the equation table, showing the difference of clock and sun every day in the year.

A New Photographic Process. — On the ground floor of the Palace of the French Institute in Paris is the photographic department connected with the Fine Art Bureau of the government. Recently a very important improvement for rendering proofs inalterable has been discovered at this *atelier*. By means of ordinary printer's ink passed over an impression by a roller, the design is made to appear with all its shadows and a white background, resembling at a little distance an engraving. The blue and yellow tints of the ordinary photograph are not produced. We are not at present made acquainted with the details of this important improvement in photographic art, which is due to the ingenuity of M. Félix Ravisson, Member of the Institute, who has charge of these processes for the State. It is intended to reproduce all the works of art in the Louvre by this non-fading process as fast as possible.

Dotting Pens. — An ingenious little apparatus for assisting in mechanical drawing has been patented by its inventor, E. O. Richter, a watchmaker in Chemnitz, Saxony. In machine drawing, projections, and the like, the drawing of dotted, half-dotted, or stroke lines is a mechanical task, the wearisomeness of which this apparatus is designed to relieve. An upright plate sliding on the paper has on its lower edge a toothed wheel catching in a bent lever which carries the pen point. A spring keeps the pen close to the paper. The wheel is kept in position by an adjustable plate. Wheels of various patterns can be used for producing a mixture of dots and strokes, the length and variations of which correspond to the indentations on the circumference of the wheel.

Parisian Police Lanterns. — Safety lamps of an original construction are used by the night policemen and watchmen of Paris. A small glass vial holds a piece of phosphorus as large as a pea, upon which is poured boiling olive oil sufficient to fill up about a third of the vial. The latter is then closely stopped by a cork. In use, the stopper is released for a moment, so as to permit the entrance of air to the phosphorus. The vacant inner space is thereupon lit up, diffusing a clear, and, of course, perfectly harmless light. When the light fades it may be revived by a fresh uncorking. A lamp so prepared will hold good for six months without renewal.

PRACTICAL RECIPES.

White Enamel for Cardboard and Paper. — The following formula for the brilliant white satin enamel applied sometimes to French cards and *papier de luxe* is given in a foreign journal: "For white and for all pale and delicate shades take 24 parts by weight of paraffine, and melt it; add thereto 100 parts of pure kaolin (china clay), very dry, and reduced to a fine powder. Before mixing with the paraffine the kaolin must be heated to the fusing point. Let the mixture cool, and it will form a homogeneous mass, which is to be reduced to powder and worked into a paste in a paint mill with warm water. This is the enamel ready for application. It can be tinted according to fancy."

Nickelization. — In Plazanet's process a bath is used of 87.5 grammes of sulphate of nickel, 20 of sulphate of ammonia, 17.5 of citric acid, and 2 litres of water. A bath much used in France is formed of a solution of 4 parts of nitrate of nickel in 4 of liquid ammonia, and 150 of water in which 50 parts of sulphate of soda have been dissolved. Using a moderately weak current the operation is at an end in a few minutes. There is no need to interrupt it by taking the objects out and brushing them. When the film of nickel is of sufficient thickness the objects are withdrawn from the bath and dried with sawdust.

Razor Paper. — To make the so-called razor paper, prepare an oxide of iron by precipitating a solution of persulphate of iron with carbonate of soda. Wash the precipitate well, and leave it of a soft consistence; then spread it on sheets of paper.

Agriculture.

FARMERS' LIFE IN WINTER.

Probably no one of the industrial classes has been so directly, and we may say disastrously, influenced by modern innovations and changes as farmers, and this relates specially to the winter life and pursuits of this class. The active work of farmers and their families was not in any degree suspended in winter until within a period of a third of a century. Indeed, the hardest labor of the year was performed by them in cold weather; they no more thought of housing themselves when the snows came than of living by begging or stealing. The country was comparatively new, and there were clearings to be made, logs to be cut, wood to be hauled, stone walls to be built (for many of our common field walls were put up in the dead of winter); the ways were to be kept clear of snow obstructions; corn was to be shelled and taken long distances to mill; the cows, oxen, horses, and sheep were to be fed, and the pigs looked after.

There were no idle hours for the farmers of a generation ago in winter; and the same may be said of the women and children in-doors. All was hurry in the kitchen from early daylight to sunset; and when the evening darkness came on, the knitting, spinning, darning, and patching continued until eight or nine o'clock, when all went tired to bed. The clothing worn by the family was of domestic make, fabrics of linen as well as of wool. The wool was taken from the backs of the sheep, scoured, carded, spun, woven, and dyed, on the farm premises. The bark of the butternut afforded a favorite tint of yellow-brown; and chipped logwood and copperas, bought of the distant grocer, gave the inky black suited to garments for Sunday use. The hum of industry never ceased in the dwellings of the earlier race of farmers, except at night and on "Lord's Day." And they were happy, healthy, contented; but little money was needed, they had few artificial wants, and their ambition was confined to the narrow limits of their homesteads.

But a great change has occurred, and now farmers have become, so far as winter life is concerned, a kind of hibernating animal, like the bears and frogs in the woods and marshes. Coal has taken the place of wood to a large extent even in the country, so there is little chopping to be done; there are no walls to build, no heavy timber to haul, but little corn to husk or shell, few sheep and cows to feed, and but little marketing to do. When the first snow-storm spreads its white mantle over the face of mother earth, all is hushed and silent around most of our farm homesteads. The crowing of a solitary cock, perched upon the barnyard fence, seems to be almost a painful intrusion upon the general silence. As regards the family, the boys are not seen around the chopping-block, or on the hay-mow; the girls are seldom seen at the windows with their knitting work, or in the snow path leading to the barn, with milk-pail in hand. The boys are away at school, or serving as clerks in some city store; the girls, if at home, sit listlessly about the red-hot parlor stove, discontented, lonely, with "nothing to do." And really, there is very little they can do; there is no wool to card or spin, no flax to run into threads, no industrial labor that will give them even a small return in ready money. The large factories do all the spinning and weaving, and make all the bonnets, stockings, and under and outer garments; and willing hands in isolated homes find no remunerative employment. The great want of the age is some industrial labor which can be performed at farm homesteads, and in the dwellings of the poor, so that a little money can be earned *at home*. In the progress of events, we have the expectation that some new avenues of industry will be opened in this direction, and when this occurs a blessing will rest upon thousands of happy homes.

The discouraged state in which large numbers of our farmers live is not favorable to health or happiness; neither is it favorable to success in any direction. Winter in the country, in New England and the other Northern States, is really quite a severe ordeal to pass through; but it can be made a time for mind improvement, and also a time of preparation for the active labors of the summer. Every good and useful book a farmer reads is an acquisition, the value of which cannot be stated in dollars and cents. Winter is the time to improve the intellect, the time to lay up those stores of knowledge which will serve in old age, when the eyes are dim and the hearing impaired, as food for thought and meditation. In the altered condition of things which prevails in this age, farmers must seek new modes of occupation in winter, and every one who seeks is quite sure to find.

GYPSUM AS A FERTILIZER.

It is useless to search in the works of the early agricultural writers for any notice of the employment of gypsum as a manure. It is possible Virgil refers to it (*Geor.* i. 80) when he is commending the use of ashes to the Roman farmers, but there is no evidence that it was extensively or even sparingly used in those early times. No chemistry existed, and of course it would be difficult for the soil-cultivators to distinguish between true sulphate and carbonate of lime. It is pretty certain it was used in Italy before a knowledge of the sciences existed; for as early as the sixteenth century some allusions are made to it by several writers. Old Barnaby Googe, in his work, "Four Bookes of Husbandrie," written in 1578, says: "The farmers like so well the powder, they esteem it farre above any doung; thinking doung not meete to be used for the unwholesomenesse thereof."

The early inhabitants of England probably found out by observation that this powdered rock did in some way improve the soil, and there exists evidence that it was employed to some extent by them. But the first experimenter with gypsum of whom we have positive knowledge was a German clergyman of the name of Meyer. His experiments were made rather more than one hundred years ago. He found the mineral in his neighborhood, and curiosity led him to apply the powder to growing plants. Its fertilizing influence was decided, and a paper was published regarding it. It was not known, however, what the nature of the mineral was; in fact, it was not until more than one generation had passed that it was known to be gypsum.

The common name by which gypsum is known among farmers is "plaster," or "plaster of Paris." It obtained this name from the circumstance of its abounding in the neighborhood of the French capital, where it is largely used after being burnt into a powder, and mixed with chalk as a stucco. When chemistry had sufficiently advanced to render accurate inorganic analysis possible, gypsum was among the first substances submitted to examination. It was found to have this composition: —

Sulphuric acid	43
Lime	33
Water	24
	100

This is the composition of a *pure* specimen, but the gypsum of commerce is usually united with a portion of silica and carbonate of lime, and iron is also found in many specimens. Almost all of our American gypseous rocks contain iron, and this mineral gives the dark hue so often observed.

There is, perhaps, no artificial fertilizer so decided in its effects upon some soils and some crops as gypsum, and yet there exists a remarkable state of perplexity and doubt among chemists regarding its mode of action. Treatises have been written to prove that its value depends upon its attraction for moisture, upon its being a direct food of plants, upon the sulphuric acid it contains or solely upon the lime, upon its influence in promoting soil decomposition, upon its action in developing ammonia, etc. These differing views have been promulgated by some of the ablest chemists of the age, and the question is still an unsettled one. It is settled, however, that gypsum does promote the growth of clover and some of the forage roots to a remarkable degree. It is also settled that it exists in these vegetable organisms in a fixed condition, which fact would seem to prove that it is capable of being taken up by plants and appropriated directly as food. But we have not time to discuss its mode of action. Our views, we take occasion to say, differ from those of most other experimenters and observers, and we may refer to this part of the subject at a future time.

We have used a considerable number of tons of gypsum at the farm during the past ten years, and always with favorable results. We are inclined to think that upon all hills not decidedly silicious, having a northern or eastern exposure, gypsum will exert a most salutary effect. It is of no use to sow it upon dry sandy plains, as the gypsum and labor are lost. Upon some meadows it proves of great service. We have observed the red clover to spring up on a meadow so thick and luxuriant, when it was sown, as to crowd out all other grasses. Upon hills it brings up the white clover in rank luxuriance, and it also tends to destroy worthless grasses and weeds. We are convinced that sufficient attention is not given to gypsum among Northern farmers. It is a valuable aid in soil-cultivation, and its cost in most places is reasonable.

SWEET FRUITS OR ACID — WHICH SHALL WE GROW?

A writer in the London *Florist* raises this question, and the following extracts will show how he answers it: —

This is a question which I put seriously to housekeepers and horticulturists. The matter, as far as puddings, pies, and even preserves go, is very much in their own hands. We may either grow or buy our sugar at will. On the former plan we have our sugar free, on the latter at wholesale or retail prices. Habit has established the custom of growing sour fruits — I use the term relatively — for culinary purposes; these fruits have to be sweetened before they are eatable; the more acid the fruit the more sugar is used, and *vice versâ*. It follows that it might be possible to use fruit for culinary purposes so sweet as to enable us wholly to dispense with sugar. Prejudice stands ready to protest that by so doing we sacrifice flavor. How so? unless, indeed, we are prepared to contend that beet and cane sugar, which are those mostly employed to sweeten our other fruits, are better, sweeter, higher-flavored, than the sugar secreted in apples, pears, plums, or other fruits. But such an argument proves too much, and really asserts that our artificial compoundings are better than Nature's more perfect mixture. We certainly do not act so in regard to our dessert fruit. In them we prefer sugar of Nature's manufacture and storing, else, as far as mere texture goes, many kitchen apples would, with plentiful additions of sugar, be equal to sweeter dessert fruit. But custom and common sense are in accord in reference to our dessert fruits, and seemingly divorced in regard to our cooked fruits. Assuredly it is not a very reasonable proceeding to grow sour fruit, in order to pile sugar over it both before and after cooking, when fruits sweet enough for almost every palate might be grown with equal ease, on the same area, and to the same or greater weight. The argument of superior flavor has no foundation in reason, and will not stand the test of trial. . . . Much sugar might be saved in preserving fruit by growing only, or mostly, the sweetest. As things have been managed in the past, the sweetest varieties have been ticketed insipid. And why? Because all fruits of the same species have generally been sugared alike, pound for pound, or three quarters of a pound of sugar to a pound of fruit, according to the receipt of the books on housekeeping, and this whether it contained 10 or 20 per cent. of saccharine matter, with the immutability of the old Medo-Persian law, or that of three minutes to the boiling of an egg, big or little. Hence, of course, the best, that is, the sweetest, fruits were sugared to excess and made insipid, and many inferior fruits were and are under-sugared, and run into rottenness and acetous fermentation. . . . The sweetness not only varies with the sorts, but likewise with the seasons, and some general means should be devised for testing, with sufficient approximation to exactness, the percentage of sugar before the fruit is preserved. But my object now is to advocate the cultivation of the sweetest varieties of fruits chiefly or only, and thus to secure the sugar in our fruit-puddings and pies, and as much as practicable of it in our preserves, free of cost.

EVOLUTION OF OXYGEN BY PLANTS WHEN NO CARBONIC ACID IS PRESENT.

The remarkable property which living plants possess of producing complicated chemical changes is a most interesting subject for study, and one which is as yet but imperfectly understood. It is now some time since the discovery was first made that green plants, while in the sunlight, have the power to decompose carbonic acid, assimilate the carbon, and set free the oxygen, it is generally believed in an active state, although some deny the latter part of the assertion. During the night the process is reversed and some carbonic acid is produced.

The experiments of Adolf Mayer, recently published in the proceedings of the Berlin Chemical Society, add another interesting fact to our knowledge of plant chemistry, namely, that certain plants liberate oxygen when exposed to the sunlight in an atmosphere perfectly free from carbonic acid. The plants which do this are those which contain acids, and the oxygen is the result of a reduction of the acid in the sunlight to some carbohydrate. To prove that this is really the case, Mayer says it is only necessary to place some leaves of a succulent plant, like a house-leek, in water which has been previously boiled to expel the carbonic acid, and then expose them to the strongest sunlight. If the plants have been kept for a while in the dark, they will, on being brought into the sunlight, give off oxygen gas. Mayer measured the quantity of gas given off per hour by a branch of *Bryophyllum calycinum* (one of the Orpine family), which occupied a space equal to 28 cubic centimetres, and obtained the following figures: —

	Decrease of Volume.	Increase of Volume.	
	0.24 c. c.	—	In dark.
	—	0.59 c. c.	In sunshine.
2 hours later.	—	0.12 c. c.	" "
	0.26 c. c.	—	In dark.

In the dark the twig consumed a quarter of a cubic centimetre per hour of oxygen, while in the sunshine it gave out more than twice that quantity of the gas. Of course after a certain time this action came to an end, as the quantity of free acid able to be decomposed ran low. The juice expressed from the branch before it was exposed to the light was decidedly acid; that which was expressed after this reduction had taken place was slightly alkaline. Similar experiments continued for a long time with this plant and with another succulent plant of the same family, the *Crassula arborescens*, led to the same result. In another experiment, where the gas evolved was collected by itself, it was tested and proved to be oxygen. This peculiar reduction process was also proved to take place in some species of *Sempervivum*. The nature

of the acid in these plants is not yet known, although citric acid seems to be one of the free acids in the *Crassulaceæ*. Plants containing oxalic acid do not evolve oxygen, as this acid cannot be reduced.

Mayer also discovered another interesting point in this connection. Plants of this kind, which had been kept in the dark until nearly all the starch had disappeared, when placed in sunlight with carbonic acid excluded again became rich in this substance, thus indicating the reduction of the acid to carbohydrates.

The phenomenon which first suggested these experiments was one observed long since by Heyne and Link, that the leaves of certain *Crassulaceæ* tasted sour in the morning, and lost this taste towards noon. The interesting results obtained by following up the thoughts suggested by this simple occurrence should encourage investigators to keep their eyes open, and never neglect to record any observation, however insignificant it appear, if the causes producing it are not understood. H.

SEEDS AND CUTTINGS.

Roadside Weeds. — A correspondent of the Boston *Cultivator*, writing evidently from a personal experience of the evils arising from the dissemination of the seeds of weeds allowed to grow up by the roadside, makes the following suggestion: "It seems to me that the farmers of Massachusetts have a right to complain that their interests are not properly regarded by the law-makers. In New York there is a law requiring the road masters to cut weeds growing in the highways twice during the growing season. In Pennsylvania a man who allows ox-eye daisies to go to seed, even on his own farm, is liable to prosecution and a fine. In Ohio the legislature passed a law last spring requiring the officers who have charge of the roads to cut all weeds and briers growing in the public ways. It seems to me that Massachusetts needs such a law as much as any other State, and that her law-makers ought at their next session to take the matter in hand. Many farmers are sent to the legislature, and they ought to look out for the agricultural interests. I have written on the assumption that there is no such law as I have suggested. I do not know that one ever was passed. Certainly no such law has been enforced. The farmers should demand such a law and see that it is enforced."

Ten Rules for Farmers. — 1. Take good papers, and read them. 2. Keep an account of farm operations. 3. Do not leave implements scattered over the farm, exposed to snow, rain, and heat. 4. Repair tools and buildings at a proper time, and do not suffer subsequently threefold expenditure of time and money. 5. Use money judiciously, and do not attend auction sales to purchase all kinds of trumpery because it is cheap. 6. See that fences are well repaired, and cattle not grazing in the meadows or grain fields or orchards. 7. Do not refuse to make correct experiments, in a small way, of many new things. 8. Plant fruit-trees well, care for them, and of course get good crops. 9. Practise economy by giving stock shelter during the winter; also good food, taking out all that is unsound, half rotten, or mouldy. 10. Do not keep tribes of cats and snarling dogs around the premises, which eat more in a month than they are worth in a lifetime.

Oriental Economy. — England washes most of the manure made by her people into the ocean, and then hunts over the globe from Egypt to Peru for more to waste. The United States does no better. But the natives of Japan and China maintain the fertility of their soil by saving what those who pretend to be civilized throw away. They have no worn out, abandoned fields.

Boston Journal of Chemistry.

Jas. R. Nichols, M. D., *Editor.*
Wm. J. Rolfe, A. M., *Associate Editor.*

BOSTON, DECEMBER 1, 1875.

HOUSEHOLD CONVENIENCES THEN AND NOW.

In this the centennial year of our national history, it is natural to think of the past, and perhaps strive to form some satisfactory idea of the real life of those who participated in the great struggle for independence. We know much of the activity and sturdy bravery of the men who lived and labored in the last quarter of the last century; and we also know to some extent *how* they lived, and under what conditions of physical comfort they conducted public and private affairs. The *home* life of our forefathers is an exceedingly interesting matter for consideration. It is made so from a knowledge of the wonderful changes which have occurred during the past century; changes which have produced a complete revolution in all domestic affairs and household arrangements. Those of us whose memory extends over a period of half a century probably have a very correct idea of the character of the homes, and the extent of household conveniences, at the time the guns of Lexington startled the colonies as by an electric shock. There are a few of the old houses still standing, some in the country and some in large towns and cities, which have battled with the storms of a hundred years, and now, like the old "one horse shay" of Dr. Holmes, have about them

"A general flavor of mild decay."

These houses in the country were built upon one model almost entirely, the old "lean-to" style. It is not difficult to understand why this plan was a favorite one. It really economized room, and by the low roof gave increased warmth and greater convenience. Our forefathers thought it necessary to construct the frames of their dwellings of white oak, and to this circumstance are we indebted for the continuance of a few of those houses to the present time. It is safe to say that no country dwelling constructed of soft second growth spruce and pine can remain habitable for fifty years, and most of those built at the present time will fall into decay in a third of a century. Nothing can be more perishable and unsubstantial than the cheap modern dwelling-houses which farmers and mechanics are constructing in all parts of the country. Not a fragment of them will remain when the second centennial anniversary comes round.

But we desire to consider some of the immense changes which have occurred in the interior plans and arrangements of dwellings during the past century. In 1775 the science of chemistry had no existence, no special attention had been given to geology, and what was known of botany, astronomy, etc., seems as nothing when compared with the extent and accuracy of our present knowledge. Our fathers were groping in almost utter darkness, so far as a knowledge of the sciences was concerned, and but little progress had been made in invention and the arts; scarcely one of the modern contrivances for cooking, and for warming and lighting dwellings, was known. Not a pound of coal or a cubic foot of illuminating gas had been burned in the country. No iron stoves were used, and no contrivances for economizing heat were employed until Dr. Franklin invented the iron frame fire-place, which still bears his name. All the cooking and warming in town and country were done by the aid of fire kindled upon the brick hearth, or in the brick oven. Pine knots or tallow candles furnished the light for the long winter evenings, and sanded floors supplied the place of rugs and carpets. The water used for household purposes was drawn from deep wells by the creaking "sweep," and it is a curious circumstance that both the well and the building meeting the necessities of a water-closet were often at long distances from the house. In a cold windy night in winter, to be called towards either of them was something dreadful to think of. No form of pump was used in this country, so far as we can learn, until after the commencement of the present century. There were no friction matches in those early days, by the aid of which a fire could be speedily kindled; and if the fire "went out" upon the hearth overnight, and the tinder was damp, so that the spark would not "catch," the alternative remained of wading through the snow a mile or so, to borrow a brand of a neighbor. Only one room in any house was warmed (unless some of the family were ill); in all the rest the temperature was at zero during many nights in winter. The men and women of a hundred years ago undressed and retired to their beds at night in an atmosphere colder than that of our modern barns and woodsheds, and they never complained. No hot-air furnaces or steam-pipes tempered the wintry air in their dwellings, and they slept soundly in the cold, even after eating heartily of shag-barks or butternuts, and then washing them down with a quart or two of hard cider. The cooking was very simple, and the nature of the food plain and substantial. But few dishes were seen upon the table; pork and cabbage, corn bread, and milk, with "bean porridge," were the every-day forms of food consumed.

Now this brief glance at the manner of life of the founders of our republic suggests thoughts regarding the changes which have occurred during the century, and the question arises, Is life now easier, happier, or more desirable? Judged from one standpoint, it is; from another, it is not. Life, that is, animal existence, it seems to us, was as satisfactory and happy then as now; that is, as satisfactory to those who then lived. The care and anxiety which follow the adoption of any device of art in households certainly detract from the comforts and advantages. A simple life, with few complex devices to care for, has strong attractions to many who are annoyed by the care of the steam, gas, and hot-water pipes which are found in modern dwellings. A dweller in the city, who retires to the country, finds in a short time that he can dispense with most of the city household conveniences without any serious disturbance to personal comfort or happiness. Looking at the home life of our ancestors from the luxurious drawing-rooms in modern cities, when we have never had experience in other modes of existence, there is little that seems attractive or even endurable in that life. The race, however, enjoyed the superlative happiness which springs from robust health, and the cold we so much dread was not sensibly felt by them. They accomplished a great work, and left for us a heritage which we shall do well to preserve and hand down to future generations.

THE JOURNAL.

We are desirous of extending the circulation of the JOURNAL so that it will be read by at least half a million of people in all parts of the country. There is no good reason why this may not be accomplished if our numerous friends will render a little aid. Doubtless each one of our present family of readers is busy, very busy, but yet they all find time to do some good, and we ask, How can a greater good be accomplished, at less cost of time and expense, than by inducing a friend or neighbor to subscribe for the JOURNAL? If the united testimony of thousands of the best men and women in our land is to be believed, no one can read this publication without being interested, educated, and made better. The young people likewise, the boys and girls connected with our schools, thousands of them at the present time are its interested readers and patrons, and it would be well if it could be placed in the hands of every youth in the country. As a popular journal of science for the family, cheap and convenient, it has no rival. It embodies the thoughts of the best minds, and presents from month to month a brief and comprehensive *résumé* of scientific discoveries and facts; and everything is presented in such a way as to be readily understood by the reader.

We have in our possession a mass of letters from teachers, professors in our colleges, chemists, authors, statesmen, etc., in all parts of the country, who voluntarily speak in praise of the JOURNAL. Also the press everywhere is kindly commending it. We hope our kind patrons will aid us in extending its circulation.

TESTIMONY TO THE VALUE OF THE JOURNAL.

It would be easy to fill an entire number of the JOURNAL with the unsolicited testimonials which it has received from the press and from its patrons since the beginning of the current volume. Our readers will pardon a brief reference to a few of these, taken quite at random from the whole number, as an appendix to the preceding article.

The following is from the *Detroit Evening News*: —

One of the very best publications of its size and pretentions is the BOSTON JOURNAL OF CHEMISTRY, a sixteen-page monthly, devoted to the science of home life, the arts, agriculture, and medicine. It discusses within this sphere, in a popular way, matters of interest to everybody, and is intensely practical. An important and valuable feature is found in the *excellent recipes* under their appropriate head in each number.

The *Old Colony Memorial*, of Plymouth, Mass., says: —

The best publication of its kind that we know of in this country is the BOSTON JOURNAL OF CHEMISTRY. Even the most casual reader cannot glance over its pages without gaining some instruction of value, and to those versed in the weightier matters of which it gives a monthly *résumé*, it is particularly interesting.

The *Free Press*, Northampton, Mass., calls the JOURNAL "one of the most useful and interesting periodicals published;" the *Salem Gazette* says that it "is one of the best scientific journals in the country;" the *East Boston Advocate*, that "it has gained an enviable position as a popular instructor of the masses;" and the *Southbridge Journal*, that it "is doing an excellent work in popularizing science for adaptation to the needs of the every-day life of the race."

From all parts of the land, and from beyond its borders, come letters laden with words of encouragement and commendation. A professor in an Ohio college writes: "Thank you for publishing such a sensible and sound practical journal for *everybody*;" and another, in St. Mary's College, Montreal, says: "I am more and more pleased with your journal, which I consider almost unique in its kind." A subscriber in Pennsylvania writes, October 27, 1875: "I could not live without the JOURNAL; could almost as well do without my three meals a day." One in Connecticut says: "No paper or periodical that I know of can take the place of your journal, and there is none that I recommend with greater pleasure." This comes from Illinois: "I consider the JOURNAL indispensable as an interesting and valuable scientific paper;" this from Missouri: "We have taken the JOURNAL from its first publication, and find we cannot do without it;" and this from Florida: "I consider one copy of the JOURNAL OF CHEMISTRY well worth the subscription price for a year;" while from beyond the Atlantic an English gentleman writes as follows: —

I have longed to tell you how much the JOURNAL is relished by myself and family. I know of no periodical we have in England that resembles it in variety of contents, and in the curious *mélange* of the scientific and the practical (though of course these are often twain made one) that is served up in every number.

From the thousands of physicians among our subscribers we are continually receiving letters like the following, dated Middletown, Conn., October 13, 1875: —

I have taken the JOURNAL OF CHEMISTRY from its first number, and have been a faithful reader of every issue, and having practised medicine for more than thirty years can bear witness that it is invaluable to the medical profession. But it is also adapted to the comprehension of all intelligent readers, and I have induced others to subscribe for it, and find them equally pleased with its contents.

The following is from the Surgeon General's Office, Washington, D. C.: "I consider the JOURNAL OF CHEMISTRY a household necessity." A Brooklyn physician, inclosing his annual subscription, adds: "The JOURNAL is worth five times the amount;" one in Prattsville, N. Y., writes: "No other paper or journal that I take, or have ever taken, do I like so well;" one in Quincy, Ill., says: "It is one of the most interesting and instructive papers I read;" and another far away in Judson, Ark., assures us: "I cannot do without it so long as I continue the practice of medicine." A New York physician says: "I am getting pretty well along in years; notwithstanding, I want your paper as long as I live;" another: "I think much of the JOURNAL, and consider it many times worth the subscription;" another: "I cannot afford to be without the JOURNAL;" and yet another: "I would not be without it on any account. I have no periodical come into my office, for the same outlay of money, which is worth one half as much as the JOURNAL." From Missouri we get this emphatic compliment: "I have invariably found the JOURNAL replete with valuable information, not only for the medical profession, but for all classes;" and just as we are writing this paragraph the following comes to hand from Billerica, Mass., bearing date November 11, 1875: —

I have taken the JOURNAL from its first number, and consider it the most valuable publication, for the price, with which I am acquainted. Every professional man, every mechanic, and every farmer should take it.

But an Ohio physician assures us that "the JOURNAL *needs* no recommendation" (the italics are his), and, lest the iteration of praise should tire the reader, we will quote these testimonials no further, but leave the JOURNAL to commend itself in the future, as it has done in the past, by what it *is*.

DEFECT IN THE NEW POSTAL CARDS.

In the *Scientific American* of January 23, 1875, I called attention to a simple improvement in the surface of the postal card which would materially facilitate the correspondence of the country. This is the addition of a very small amount of silica, alumina, carbonate of lime, or other *grit* to the sizing of the paper, so as to convert the card into a tablet capable of receiving fine, black, indelible marks from a hard metallic point. The expense of this modification would be inappreciable, while it would allow twice as much to be written on a card, and twice as legibly, as with an average pen or pencil. It would not interfere, at the same time, with the use of ink. Incidentally be it said that carbonate of lead or other poisonous gritty substances should be avoided on the postal card.

I also ventured to recommend that the Post-Office Department should manufacture and sell for one cent apiece (at a profit) miniature metallic pointed styles for the vest pocket. One of these would suffice for a year's correspondence. They may be made of a cylinder of suitable alloy two inches long and one eighth of an inch in diameter, wound with fancy paper until the diameter equals one sixth of an inch, and then varnished; or the metallic cylinder may be surrounded with paper pulp, pressed in a mould (*papier maché*), colored, and varnished; or the pencil may be made of polished wood, two and a half inches long, with a metal point inserted in the usual way.

Lead is commonly used as the basis of a hard, granular alloy for writing on tablets with a mineral surface. But sufficient bismuth or other hard metal must be added to give it the proper texture. The pencil also must be exactly suited to the surface on which it is to write. This is a sufficient reason why the Post-Office Department should furnish pencils with its cards.

The old postal cards contained accidentally sufficient gritty matter in the sizing to give a tolerable mark with a metal point. The new postal cards, instead of improvement in this respect, have gone decidedly backward. The public have heartily applauded the new cards for their many excellent qualities. Why should not this benefaction have been added to the rest?

A small matter, when of universal application, becomes important. For this reason I renew the suggestion at the end of a year. W. F. C.

EDITORIAL NOTES.

PEARLED WHEAT. — Another device of the Cold Air Attrition Company, of Chicago, who grind the whole wheat into clean, excellent flour, is to remove the woody fibre from the wheat grain by attrition, and thus fit it for most excellent food without grinding. In its prepared state it resembles the pearl barley, so long known to housekeepers, and it can be cooked by boiling or baking, so as to form a de-

licious and healthful dish for breakfast or tea. We have used a package of this prepared wheat, and we shall hereafter not be without it in the family.

Dr. Cutter's New Chair. — There are but few more industrious and thoughtful men in the country than Dr. E. Cutter. He keeps in advance not only of his profession, but of most other departments of science and art. The new chair for invalids combines some important features not found in other devices, and we cannot see why it does not meet a want long felt by invalids, surgeons, physicians, etc. As a chair for household use, in which is found great ease and comfort, it is not surpassed. The structure is of iron and very substantial, yet light and easily moved. A brief description of the chair, with a cut, is presented in another column.

Alcohol in Ginger Beer. — It will be startling and possibly painful intelligence to many of our "total abstinence" friends, that one of their favorite beverages, ginger-beer, is really a fermented liquor, and contains alcohol in proportions varying from 2 to 5 per cent. In a series of articles on "Modern Researches on Alcohol," now appearing in the London *Sanitary Record*, Dr. Bathurst Woodman says: "I should be very sorry to diminish the sale of ginger-beer, which I regard as one of the best of our summer beverages, containing, as it does, in almost all samples, either free citric or tartaric acid, or the almost equally beneficial bitartrate of potash. I have before me the receipts of several large makers, and take the first that comes to hand. It contains, besides ginger, tartaric and citric acids, 200 lbs. of sugar to 180 gallons of water. These ingredients are duly fermented, etc., and then bottled. Now, 200 lbs. of sugar (cane sugar) will produce in fermentation nearly 100 pints of alcohol; and, making all allowances for loss in yeast, by evaporation, in bottling, etc., it is quite plain that this liquor will contain about 4 per cent. of alcohol, and the result of actual experiment shows the same. The other receipts only differ slightly in the amount of the saccharine substance, as regards the water, or the kind of sugar present, or the acid employed. This percentage of alcohol is, of course, about half the strength of most of the malt liquors in common use by the middle classes of this country, but about equal to many of the cheaper ales, and to much of the beer drunk in Germany and other parts of the Continent."

ATOMS.

It was Dr. Johnson who said in his old age, "My diseases are an asthma and a dropsy, and, what is less curable, *seventy-five*." — At the recent British Pharmaceutical Conference at Bristol, there were exhibited infusions of gentian, rhubarb, orange peel, cusparia, buchu, senega, and senna, mucilage, lemon juice, and flour paste, which had been preserved from two to four months by the addition of half a grain of salicylic acid to the fluid ounce, and were in most cases scarcely distinguishable from fresh preparations. — The British Admiralty have ordered a hundred of Captain Boyton's water dresses for the coast-guard service. — "Fish flour" is a new article in the English market; it is prepared from dried fish of the first quality, which is thoroughly desiccated and then ground in a mill. — The following method is used in Germany for the preservation of wood: Mix forty parts of chalk, fifty of resin, and four of linseed oil, melting them together in an iron pot, and then adding one part of native oxide of copper and afterwards one part of sulphuric acid; this mixture is applied with a brush, and when dry forms a varnish as hard as stone. — The aggregate age of 156 paupers in a Scotch parish at the present time, according to an Aberdeen paper, is 12,075 years, or an individual average of more than 77 years. — It has recently been announced that a joint stock company has been formed in London with a capital of one million dollars for the manufacture of Gramme's magneto-electrical machine, which, it is confidently expected, will be widely applied to the production of light, to the electro-deposition of metals, and to various chemical manufactures, etc. — An educational journal speaks of the "heliotrope" illustrations in one of Osgood & Co.'s books; whereupon the *Transcript* asks: "Is the schoolmaster abroad, or is this merely a flower of speech?" — The state crown of Queen Victoria weighs 39 ounces 5 pennyweights troy, and contains 3093 jewels, 2783 of which are diamonds, 277 pearls, 17 sapphires, 11 emeralds and 5 rubies, including the famous ruby said to have been given to the Black Prince by Don Pedro, King of Castile, after the battle of Najera, in 1367. — A correspondent of *Land and Water* states that a cat lately brought up four kittens in a hollow in an elm in Victoria Park, London, the "nest" being about twelve feet from the ground. — *Appletons' Journal*, in a notice of Rolfe's edition of "Goldsmith's Select Poems," remarks: "The use of such books in the school-room cannot but contribute largely toward putting the study of English literature upon a sound basis; and many an adult reader, whose school-days are over, would find in the volume an excellent opportunity for becoming critically acquainted with one of the greatest of last century's poets." — Experiments made at Mülhausen prove that chopped straw is the best coating for preventing the escape of heat from steam-pipes, reducing the loss by radiation 66 per cent. — The *Nursery* is now used as a reading-book in the primary schools of Worcester, Salem, New Bedford, Fall River, and several other of our cities, greatly to the satisfaction of scholars, teachers, and supervisors; and, indeed, any other result would have been surprising. — According to careful calculations, the forests of our country will hold out only seventy years, if we go on using wood as recklessly as we now do, without taking measures to renew the natural sources of supply.

POST-OFFICE ADDRESSES WANTED.

The publishers of the Journal are continually receiving remittances from subscribers who neglect to give their post-office address, or any part of it. Not unfrequently a second letter or card comes (as in the case of John Mitchell, who had sent $3), complaining because the first is not acknowledged, but again failing to furnish any clue to the post-office. If the postmark is legible, as it seldom *is*, that answers the purpose; or if the town is given, the county and State may be found with the aid of the "Postal Guide," though often only after looking through the lists of subscribers in ten or a dozen towns of that name in as many different States. If the subscription is a new one, and the name of the town a common one, the State can be only guessed at. In all cases the FULL post-office address — *town* (or *name of post-office*), *county*, and *State* — should be given. The publishers earnestly request that subscribers will bear this in mind; and the following persons will understand that their remittances *cannot* be acknowledged until they furnish their addresses: —

John Mitchell,
Mrs. Anna Dyer,
N. C. Poor,
C. B. Jones,
J. L. DuFief.

LITERARY NOTES.

The Lippincotts publish the second revised and enlarged edition of Dr. H. C. Wood's *Therapeutics, Materia Medica, and Toxicology*, the first edition having been exhausted in little more than a year — a proof that the work is appreciated by the medical profession. In the new issue some portions are rewritten, but the chief changes consist in the additions. Nearly three hundred references have been added to the old articles, and many new articles introduced, including those on coffee and tea, tobacco, arnica, eucalyptus, picric acid, lithium, oxalate of cerium, jaborandi, salicylic acid, cold and heat, electricity, etc. The new matter fills about a hundred pages, but owing to the change of type these are equivalent to at least a hundred and fifty of the first edition. The work may be found at Mr. Jas. Campbell's, Tremont Street.

Messrs. Lindsay and Blakiston have recently issued the *fourth* American from the fifth London edition of *Acton on the Reproductive Organs*, treating of their functions and disorders in childhood, youth, adult age, and advanced life, considered in their physiological, social, and moral relations. As a scientific treatise on the subject the work is a standard authority, and a leading English review justly remarks that "the spirit which pervades the book does credit equally to the head and to the heart of the author."

A new volume of the "International Scientific Series" is *Money and the Mechanism of Exchange*, by Prof. W. S. Jevons. Considering the general ignorance of the subject, even among our legislators, it appears very opportunely. The public money might not be unwisely appropriated in supplying each member of Congress with a copy. It treats in a scientific yet popular way of the past and present monetary systems of the world, the materials used for coinage and the natural laws that govern its circulation, the relations of coin to paper currency, and the system of commercial exchange. The more abstruse problems of monetary science are lightly touched, as not coming within the scope and compass of an elementary work.

The publication of the *Discourses on Architecture* of Viollet-le-Duc by Osgood & Co. is a noteworthy event. So far as we are aware, it is the first work of any value or authority on the theory of architecture that has appeared in this country: and we know of nothing in the English language that is worthy to be ranked with it as a presentation of the great principles and laws of the art. "Its peculiar claim to attention," as the translator, Mr. Henry Van Brunt, remarks in his admirable introduction, "consists in the fact that its argument is an appeal to philosophical analysis against the tyranny of tradition and usage in matters of architectural design." "I am convinced," the author says, "that we can bring the taste of this generation to perfection by making it reason." It is a book, not for the architect alone, who of course cannot afford to ignore it, but for every man who is interested in questions affecting the uses of art in life. "If architecture" (to quote again from the introduction) "in its good estate is an art amenable to laws, and not a mere body of arbitrary formulas, every layman should be capable of an intelligent appreciation of it without a course of technical study, and the architect could no longer cover his errors of ignorance, carelessness, or haste behind the specious shield of conventionality." The translation, being the work of one who is both an architect and a scholar, is exceptionally well done. The many excellent illustrations of the original have been reproduced in faultless style, and the mechanical execution throughout is worthy of the book and an honor to the publishers.

One of the favorite gift-books of the season will be the beautiful holiday edition of Whittier's new poem, *Mabel Martin* (Osgood & Co.). The story is one of the old witchcraft days, and is charmingly told. The illustrations are more uniformly excellent than those in similar books of former years from the same house.

The *Poetic Localities of Cambridge*, edited by W. J. Stillman (Osgood & Co.), contains the best work we have yet seen in the way of heliotypes from nature. It is a great advance on the illustrations of Newport in Colonel Higginson's book, published two years ago. The "Gambrel-Roofed House," the Washington Elm, the chestnut-tree of "The Village Blacksmith," and other things in Cambridge that have been immortalized by Longfellow, Lowell, and Holmes, are pictured with photographic accuracy, and accompanied in the letter-press by the passages which they illustrate. The idea is a good one, and tastefully carried out.

The House of the Seven Gables has appeared in the new edition of Hawthorne, after the pattern of the "Little Classics;" and the concluding volume of the latter has been issued, under the title of *Authors*, containing brief biographies of all the authors represented in the series. We should not know where else to look for an account of some of the more recent authors in the list, who are not to be found even in Allibone.

The Ship in the Desert, Joaquin Miller's new poem, has been published by Roberts Bros. It is in some respects the best work of the eccentric author, who, as the *Saturday Review* remarks, whatever may be his faults of style, "possesses the genuine poetic faculty." Some of the word pictures of natural scenery are wonderfully graphic and vivid.

The popular book for the young folks, this season, will be Mr. Scudder's *Doings of the Bodley Family*, which Houghton & Co. have brought out in unique and captivating style. It is full of life and fun, and profusely illustrated, even the inside of the covers being crowded with comical silhouettes.

Lockwood, Brooks, & Co. (who have all the above books for sale) publish, for the Tract Society, *Apples of Gold*, a very pretty juvenile, crowded with pictures, some of which are colored. It is surprisingly cheap at a dollar.

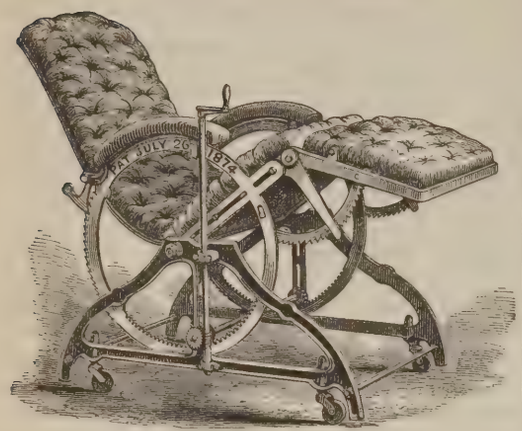
The *International Review* completes its second year with one of the ablest and most brilliant numbers it has sent out, and promises even better things for the new volume. By our "Clubbing List" it will be seen that we furnish it *with the* Journal for the regular price of the review alone.

Messrs. Houghton & Co. have published an excellent life-size portrait of Longfellow, which can be had only by subscribers to the *Atlantic*, to whom it will be sent with the magazine for 1876 for $5.00, or only a dollar more than the regular subscription. It is worth a score of the usual "premiums" offered with periodicals.

The *Bulletin de la Societe Industrielle de Rouen* for the first quarter of 1875 contains some valuable and interesting papers on chemical, mechanical, and industrial topics. It is in all respects creditable to the society and its managers.

Medicine and Pharmacy.

A NEW RESTING CHAIR.



The new chair invented by Dr. E. Cutter, and represented in the above cut, involves some novel features which are not to be found in similar devices. The back of the chair, the seat, and the leg portion have each an independent motion in vertical planes corresponding to the motion of the great natural divisions of the human body. The arrangements allow of the variety of changes which are found existing in the human body in a state of perfect rest. Having made these adjustments the whole series of inclined planes can be made to revolve about a common centre, and the weight of the body can be thrown from one division on to another, or distributed equally over the entire body surface. At the same time the chair allows of the motion of the hip and knee joints. An endless screw gear secures an equable, firm, and certain movement, with no fear of detachment or breakage under ordinary usage. The feet may be easily raised higher than the head, thus allowing the return of the blood from the extremities by reversing the hydrostatic pressure of the column of blood in the veins — a very desirable arrangement in cases of cardiac disease. A very simple but effective apparatus for extension in fractures may be connected with the leg portion, making a triple inclined plane, if possible an improvement upon the famous "double inclined plane" of Charles Bell. Three cases of fracture of the lower extremities have been successfully treated upon this device. This chair can be brought up to the same level as the bed on which a patient may be lying, who can then be transferred directly to the chair without lowering to the floor. The workmanship is durable and may last for generations. It is especially designed for invalidism in its varied forms where the decubitus is dorsal. The style and upholstery vary with the taste of the purchaser.

THE PHYSIOLOGY OF FATIGUE.

Dr. G. V. Poore contributes to the *London Lancet* a valuable article on this subject, which we condense for the readers of the Journal as follows: —

Work results in fatigue, and fatigue is a regular and constantly returning symptom experienced by all of us. Periods of functional activity invariably alternate with periods of repose, during which the waste caused by the exercise of function is repaired. We are indebted to Sir James Paget for having pointed out that "rhythmic nutrition" is a law of nature. . . . Our whole life consists of a series of vibrations — periods of tension alternating with periods of relaxation; and although the rapidity of these vibrations varies immensely, they are recognizable in all our acts, be they voluntary or involuntary. Let us look first to the "vibrations" of an organ the movements of which are placed entirely beyond our own control — the heart. Now, the rate of vibration of the heart is 72 per minute, and if the total period of each vibration be divided into ten parts, it will be found that four of these parts are devoted to the process known as *systole*, which may be looked upon as labor; three are occupied by the *diastole*, which, although hardly labor is nevertheless exercise of function; and the remaining three parts are occupied by the *pause*, during which the heart apparently enjoys absolute rest from any exercise of function, and may be considered to be in a condition analogous to sleep. May we not apply the rate of action of this organ, which has been regulated for us, to our voluntary acts, and may not the heart be made to give the key-note, as it were, to many questions, personal and social? If we divide the day of twenty-four hours into ten equal parts, and give four of these to active work, three to functional exercise of other kinds, and three to sleep, we shall find that nine and a half hours' work, seven and a quarter hours' "relaxation," and seven and a quarter hours' sleep, is what a normal man may perform without injury to himself. . . . .

It is universally ordained among civilized nations that once in every seven days there shall be a remission of labor and a change of occupation; and it is highly advisable for those who are occupied in monotonous pursuits to break away from them at least once a year, and indulge in that variety of work which we call amusement. Monotonous repetitions of the same act are the most potent causes of fatigue. "It ain't the 'untin as 'urts 'im," said *Punch's* horse-dealer, "it's the 'ammer, 'ammer, 'ammer on the 'ard 'igh roads;" and in this remark there was undoubtedly much practical wisdom.

Fatigue occurs as soon as we attempt to alter the rhythm of our vital vibrations by prolonging the periods of tension at the expense of the periods of relaxation, or by demanding for any length of time a quickening of the normal rate of vibration; and it is not unreasonable to suppose that every organ of the body has its "normal rate of vibration," if we could only determine what it is. . . .

Fatigue may be general or local, and both forms may be either acute or chronic. . . .

General fatigue is recognizable with ease both in its acute and chronic forms. There is a disability for performing either mental or physical work, and this disability is noticed first in work requiring attention and sustained effort, and, lastly, in those acts which have become automatic. The symptoms of general fatigue are referable usually to the brain and nervous system.

The symptoms of *local fatigue* are referable usually to the muscles; but we must always bear in mind that muscle and motor-nerve are one and indivisible, and that recent experiments have given great probability to the idea that every muscle is connected with a certain definite spot in the brain. When, therefore, we speak of a sense of fatigue we must necessarily be in doubt, notwithstanding the fact that the symptoms are referred to the muscle, whether brain, nerve, or muscle, one or all of them, be really at fault. The symptoms of acute local fatigue are (1.) *loss of power* to a greater or less extent. By too frequent or too prolonged stimulation the irritability of muscular tissue becomes exhausted, and it either refuses to respond or responds but feebly to the stimulus of the will; our power of adjusting the force of contraction to the act to be accomplished is lessened, and accuracy of movement and delicacy of coördination become impossible. (2.) *Tremor*, which every one who has been called upon for extraordinary muscular effort must have experienced. (3.) *Cramplike contraction*, which disturbs our rest after a hard day's walking or riding, or muscular efforts in the ball-room or elsewhere. (4.) The *pain* of fatigue, which is familiar to most of us, and is readily distinguishable from other forms of pain.

Local fatigue is caused far sooner by prolonged and sustained muscular effort than by repetitions of short muscular efforts having due intervals of relaxation between them. Any one who has attempted to hold out a weight at arm's-length knows the impossibility of a long continuance of the effort, and it is proverbially true that standing in one position is to most people far more tiring than walking, the reason apparently being that in standing the muscles which support the body are subjected to a prolonged strain, while in walking we use the muscles on either side of the body alternately. The great increase of working power which we obtain by this alternating use of the muscles would seem to be one of the chief reasons for the bilateral symmetry of the body. Not only is sustained effort a far more potent cause of fatigue than repeated effort, but we find that, when fatigue supervenes, actions requiring sustained effort, be they physical or mental, are the first to fail, while automatic actions endure the longest, and in this respect local fatigue resembles general fatigue. . . .

Chronic local fatigue has causes and symptoms similar to those of acute local fatigue, and this condition is probably a common cause of many of those chronic maladies which seem to result from overwork, and which are characterized by irregular muscular action. That some cases of writer's cramp, torticollis, and hammer-palsy are due to chronic fatigue of the muscles employed, there can be little doubt. . . .

THE ARSENIC EATERS OF STYRIA.

When an account of the Styrian arsenic eaters was first published in England several years ago, it was thought by many to be a scientific hoax, and even to this day the facts are sometimes questioned. Facts they nevertheless are, and we find in recent foreign journals some fresh testimony on the subject. At a scientific meeting held within a few months at Gratz, in Styria, Doctor Krapp presented two arsenic eaters of the district, and gave the following interesting details concerning the practice: —

It is difficult to give precise statistics as to the increase in the number of arsenic eaters in Styria, but I am convinced that there is a great number of them. They are mostly stable boys, wood choppers, and foresters; there are also some women. Many of these individuals commenced the practice at the age of seventeen or eighteen years, and have continued it to a very advanced one. They generally keep the fact a secret; consequently it is difficult to realize the actual development of the practice. They give as a reason for this habit that it protects them from other maladies, and also gives them an appearance of real health; that it is a remedy for difficult respiration, and also aids the digestion. A hunter who ate arsenic before my eyes assured me that he acquired courage little by little so as to continue the practice. There can be no doubt that the arsenic eaters enjoy seeming good health, and are very robust. I think it can only be very strong persons who could take up and continue this habit; some of them arrive at a great age. I saw at Zeirung a coal miner aged seventy years, who was vigorous and alert, and who I was told had followed arsenic eating more than forty years. Another case was that of a chamois hunter, aged eighty-one years, who for many years had made use

of it. It results, from further observations that I have made, that either the white or yellow arsenic is made use of, and in a dry state. The dose is naturally very small at first, increasing gradually: the largest dose that I saw taken was 14 grammes. There are intervals between the doses of fifteen days, a week, and sometimes only two or three days.

[Communicated to the Boston Journal of Chemistry]

CHLORHYDRIC ACID AND PEPSIN THE NATURAL DIGESTIVES OF ALBUMINOUS FOOD.

BY R. ROTHER.

After Schmidt and other eminent physiologists had established the fact that free chlorhydric acid is a necessary adjuvant to the gastric function, and that no other acid can approachingly replace it in the total absence of chlorides, then such investigations as that recently published in the *Druggists' Circular* by R. M. Smith and George Hay, of Philadelphia, have merely the weight of any other delusive and evanescent phantom. The reported investigation is based upon ignorance and error in the start, and does not possess a vestige of scientific semblance to support the pretended result. It is stated that the semi-digested contents of the stomach of an executed criminal were distilled at the lowest possible temperature required, and the distillate was found to be lactic acid. Lactic acid, however, is known to be a non-volatile acid, and only mere traces are mechanically carried over by the aqueous vapor when large quantities of it are protractedly boiled with water. The investigators do not give a solitary distinguishing test for lactic acid, but simply assume its presence. They undoubtedly obtained an acid distillate, and in the nature of the case it could not possibly be otherwise, since propionic, butyric, and acetic acid, all of which are volatile and easily distilled, must necessarily be present, by reason of the action of peculiar ferments, always present in albuminous food, upon amylaceous and saccharine constituents of the nutritious matters. Lactic acid was unquestionably present, but not in the distillate. Under the existing circumstances chlorhydric acid, although largely present, could not appear in the distillate at so early a stage of the operation, because a denser liquid and higher temperature would be required to separate it from its temporary combination with the protein matters. Physiologists have conclusively shown that in the course of peptic septism the formation of syntonin hydrochlorate precedes the ultimate appearance of pepton. The writer's theory of septism makes this simply a process of condensation through the medium of a septase, so that by means of this concentration certain bodies may combine or mutually decompose, which under ordinary circumstances would not react upon each other.

The writer assumes that peptic septism takes place and progresses in a mixture of chlorhydric acid, pepsin, and albumin, by a concentration of the chlorhydric acid upon the albumin through the intervention of pepsin, forming syntonin hydrochlorate as a link in the chain of the proteic metamorphosis. The continued pressure of pepsin crowds forward additional albumin, causing the chlorhydric acid of the syntonin hydrochlorate to revert upon this and force along the altered syntonin as a final link in the condition of pepton, which then drops away ready for assimilation. If no more albumin is available, the syntonin hydrochlorate is ultimately converted into pepton and free chlorhydric acid. The accumulation of free chlorhydric acid at the close of the digestive process accords with this theory completely. The two investigators as above stated interrupted the process of digestion midway, and at a most disadvantageous stage to arrive at certain results. Of course the appointment of the proper period for the examination was not at their discretion, but then, such cases are not the most suitable for investigation of that kind. The semi-chymefied masses would on distillation or filtration yield no free chlorhydric acid, that is, free in the common acceptation, because during just that period it would naturally be locked up as syntonin hydrochlorate in combination with unaltered albumin.

There is no necessity, in the writer's opinion, to undertake such experiments with a defunct organism, since a living subject would be a more proper and convenient means for securing decisive and reliable results. Physiologists have resorted to various resources of experimenting in this direction upon living subjects. With such devices they sought to obtain gastric juice free from contamination of food matters, as under such circumstances only can correct conclusions as to its composition be formed. By the introduction of solid particles the stomach is irritated and a secretion of gastric juice takes place, which operators heretofore were in the habit of removing through artificial openings. Such investigations could then be undertaken only with lower animals or with human subjects when through some abnormal cause a perforation of the stomach existed. The writer, however, believes that the surest and most ready method is to experiment on a healthy human subject directly. Any investigator can, perhaps, best experiment on his own person, since it is such an easy method to empty the stomach most completely by emesis. In case it was desired to examine the clear gastric juice, the operator could just before ordinary meal-time drink plenty of water containing some pepper and small particles of some inert substance, and after a short time empty the stomach by emesis induced by tickling the fauces with a feather. In order to examine a fully digested meal the stomach could be emptied by the same means as in the first instance.

MEDICAL MEMORANDA.

Salicylic Acid. — Some very important observations on salicylic acid by Dr. Wagner appear in a recent number of the *Journal für Practische Chemie*. The main points that he makes may be summarized thus: (1) Salicylic acid is superior to carbolic acid as a disinfectant for fresh wounds and old sores; (2) in eczema of the head and face, with discharge, salicylic acid is extraordinarily efficacious, presumably because it quickly destroys the contagium; (3) in all cases where fermentative changes occur in the contents of the alimentary canal, salicylic acid acts more efficaciously than other antiseptic substances, since it can be administered in larger doses; (4) its use is highly promising as a prophylactic in all diseases in which it is believed that the morbid processes are connected with microscopic organisms; (5) in diphtheria, not only is salicylic acid a powerful restorative remedy, but it also appears to shorten the course of the disease.

In the Journal for October an error of *The Doctor* in translating Dr. Wagner's formula for a gargle to be used in diphtheria was inadvertently copied. "Salicylic acid, 150 parts" should apparently be 1.50 or 1.5 parts, as we learn from other authorities that the gargle contains about one per cent. of salicylic acid. The same error is reproduced in the October number of *New Remedies*, where it is duly credited to *The Doctor*. In the new revised edition of Dr. Wood's "Therapeutics" (p. 608) there is an inaccuracy in what is obviously a reference to the same formula, the words in brackets being omitted in the following sentence: —

"In *diphtheria*, Dr. Wagner gives to young children two to five grains of the powder every second hour, and when the patient is of sufficient age, employs a gargle containing twenty-three grains dissolved in about five drachms [of alcohol] and diluted with eight ounces of water."

As one part of salicylic acid requires four of alcohol for its solution, only about four of the "150 parts" would be dissolved by the 15 parts of alcohol given in the formula as printed by *The Doctor*. In water the acid is much less soluble, three hundred parts of the former being required to one of the latter.

Carbolic Acid Vapor in Whooping-Cough. — Dr. Burchardt, of the University of Berlin, states that he has used the steam of a solution of carbolic acid in water (1½ to 2 parts of acid in 100 parts of water) for inhalations three times a day, with perfect and speedy success, in the treatment of whooping-cough. The same inhalations, he adds, may also be used with great advantage in other affections of the respiratory organs. This use of carbolic acid will be no new thing to many American physicians, who, to our personal knowledge, have prescribed it more or less in these affections for several years past.

New Mode of Administering Raw Meat. — M. Laborde, in a French medical journal, recommends the following method for the preparation of raw meat: Make a not very thick broth of tapioca, and let it cool. The meat, finely scraped, is diluted with a quantity of cold soup, with which it is thoroughly mixed until it looks like tomato soup. The tapioca is then turned in, little by little, with constant stirring. A homogeneous liquid is thus obtained, in which, when properly made, the meat is so thoroughly disguised that the person eating it does not suspect its presence. The preparation has often been given under the name of "medicinal porridge of tapioca," and has proved very acceptable to the patients.

Therapeutical Use of Iodide of Starch. — Professor Bellini, of Florence, has lately presented to the Royal Medical Society of that city a memoir in which he recommends iodide of starch as an antidote and eliminant. As an antidote it is, first of all, of value in poisoning by sulphuretted hydrogen and other sulphur compounds, alkaline and earthy; also in poisoning produced by caustic alkalies and ammonia, but in these cases it should only be used until acid drinks can be procured. In the next place, it is recommended in poisoning by those alkaloids to which tincture of iodine has been considered an antidote; the iodide of starch is far less irritating. As an eliminant, Professor Bellini says it may often be used instead of iodides, bromides, chlorides, and alkaline hyposulphites, to remove mercury or lead from the system. It is not pretended to be superior to these, but is more agreeable to take, and perhaps as effective. Children will readily take it in the form of syrup. When used as an antidote it should be followed, at a proper interval, by an emetic.

Digestible Blood Powder. — The powder obtained by the evaporation of blood is nearly as insoluble in water as sand, and quite indigestible. The preparations met with in commerce under the name of *extract of blood* are not quite so insoluble, but the absence of hæmoglobin in them (which forms 86 per cent. of the corpuscles) can be easily shown by the spectroscope. Having lately required a large quantity of blood for researches on this liquid, M. Le Bon sought to reduce it to powder without altering its composition and properties, and he believes he has succeeded in doing so by operating (with special apparatus) at low pressure and a temperature not above that of the body. He showed the French Academy a specimen kept eighteen months. You shake the powder in water a few minutes, then filter the solution, and thus obtain a beautiful red liquid having all the properties of defibrinated blood. In pepsine the powder is shown to be perfectly digestible. M. Le Bon points out that this soluble

blood, which has parted with four fifths of the water it contained, is a most nutritious aliment with small volume. It might be associated with farinaceous food and thus a diet would be provided physiologically complete. Its richness in iron and its tonic properties render it also a valuable therapeutical agent.

HYGIENIC AND SANITARY NOTES.

Being "Out of Sorts." — In his presidential address before the Clinical Society of London, Sir William Jenner alludes as follows to the bodily condition which is popularly called being "out of sorts:" —

"We are apt to pay too little attention, to attribute too little importance, to the general — to use a very barbarous expression — 'out-of-healthedness' which is so common in previously healthy persons from overwork, from anxiety, from over-feeding, from over-stimulation short of so-called intemperance, from want of food, from bad air, from deficiency of exercise, from deficiency of stimulus; to 'out-of-healthedness' in which the patient refuses to admit that he is ill, although he is a little, as he says, out of sorts, and only seeks advice because his friends notice that he does not look well, and urge him to consult a physician. This condition cannot be studied in hospitals. Those only who are engaged in family practice can trace the origin, can watch the course, can estimate the effects, of this condition in all its bearings. For myself, I have been long satisfied that a very large proportion of the subjects of organic diseases, tubercular, malignant, and degenerative, using those words in their widest sense, are mistaken when they attribute the symptoms of imperfect health, from which they have long suffered, to incipient local disease, and for not detecting which they too often blame their first medical attendant. The deteriorated general nutrition to which I have referred as mere 'out-of-healthedness' was the cause of their sense of want of perfect health; and, ultimately, this imperfect general nutrition of every part of the body culminated in the extreme malnutrition of that part or organ which natural constitution or accidental circumstance had rendered less able to resist organic change."

Food and Growth. — A report by Dr. Fergusson before a Royal Commission on the Factory Act declares the growing degeneracy of children in the factory districts of England. He does not attribute the ills which he describes to the labor itself, but almost entirely to the unwholesome habits of the parents, to their intemperance, and to their excessive use of tobacco. He states that the latter form of excess is not confined to the parents; for that at least one half of the boys in the mills either smoke or chew tobacco, or both; and he adds that, however an adult may be able to bear moderate smoking, there can be no doubt of the prejudicial operation of the practice upon the healthy development of a growing child. He also strongly condemns the general substitution in this district of tea or coffee for milk in the food of children; and relates what might be called some experiments which he has tried, in having milk given twice a day to feeble children by mothers, or managers of mills, whom he could trust. The children so treated grew and increased in weight nearly four times as fast as others of the same age who had tea or coffee instead of milk; the increase of weight of the latter, between the ages of thirteen and fifteen, not exceeding 4 lbs. a year, while that of the former was as much as 15 lbs. a year. To the causes thus enumerated it would probably be necessary to add the influence of very early marriages, and of total want not only of care, but also of knowledge, with regard to the rearing and management of children.

Fish Diet. — Dr. A. D. Binkerd writes to the *Philadelphia Medical and Surgical Reporter* as follows: The chief objection to salt fish as an article of diet is its universal fishiness. No one wishes to be constantly reminded of what he has eaten. That which goes to supply our temporal wants should be like alms given to the poor. It should be heard of no more.

It is not generally known that salt mackerel (*Scomber vulgaris*), and indeed any salt fish, may be eaten with impunity when properly cooked and served up with lemon. A fresh lemon, sliced and laid over a dish of properly cooked salt mackerel, when brought to the table emits an odor, when mingled with the fishy odor, that is to most persons absolutely agreeable, and in many persons even whets the appetite.

If the juice of the lemon be now pressed out on to the fish the taste is very much improved. No eructations follow, though you drink freely of water after the meal.

As a vehicle for taking cod-liver oil, lemon juice serves an excellent purpose, and should be especially recommended to patients of a rheumatic diathesis.

TOXICOLOGICA.

A New Poison. — The London *Chemist and Druggist* says: "Fifty-eight boys in the Forest Gate Industrial School have lately served their generation by discovering the poisonous character of laburnum root. Finding roots of a laburnum-tree which had been cut across, these fifty-eight adventurous and voracious young investigators commenced the mastication of whatever bits thereof they could get at, under the idea, apparently, that they had discovered a mine of 'stick liquorice,' or of some root which would prove a worthy substitute for that delicacy. Symptoms of narcotic poisoning soon ensued, varying in degree from mere sleepiness to complete stupor. The medical officer of the school, Dr. Vallance, of Stratford, had a stiff day's work in supplying emetics to the boys and in keeping them awake. Ultimately, however, all the boys recovered, and the doctor thinks the root probably possesses valuable therapeutic properties. The poison seems quite free from acridity. If the practice of medicine should be advanced by this experiment, we hope the fifty-eight will feel amply rewarded for what temporary inconvenience they may have suffered."

We presume the laburnum meant is the *Cytisus laburnum* of Europe (the *Laburnum vulgare* of Wood), familiar also in this country. It has long been known that the leaves, bark, and especially the seeds, are poisonous. Husemann and Marmé in 1865 obtained from the seeds two highly poisonous alkaloids, which they named *cytisine* and *laburnine*. We have seen in a recent English agricultural journal an account of the poisoning of some horses by feeding on laburnum leaves. It is not strange that the root should be poisonous, though the fact has not been noted till now.

Singular Case of Arsenic Poisoning. — The roundabout way in which the careless disposal of a little arsenic may lead to fatal results is well illustrated by the following case reported in a London journal: "A child at Rotherham was poisoned by eating some broth containing arsenic. The history of that arsenic was curious. At the Rotherham Glass Works an arsenic tub was sold for 9d. to a man named Thomas Waller. He resold it to a family who wanted one for washing purposes. It had been washed out previously. Some clothes were washed in this tub one day, and were afterwards transferred to a boiler, and some of them to a tin saucepan. The saucepan was next day washed out and then used to make broth. Nine persons partook of the broth thus made. All were ill, and a child four years old died the same day. Mr. Baker, F. C. S., of Sheffield, analyzed some of the remaining broth, and found it to contain a quantity of yellow sulphide of arsenic equivalent to 35 grains of white arsenic to the pint. The jury thought that arsenic-cask selling ought to be checked."

A Sensible Coroner. — At Barnsley, England, a druggist sold a woman a bottle of "soothing syrup," manufactured at Oldham, and a child, aged eight weeks, to whom an overdose had been administered, subsequently died. The physician who attended the child said the soothing syrup contained paregoric. In the course of an animated discussion between the coroner and the druggist, the former said that the book recommending the medicine, and the medicine itself, were both barbarous and dangerous, and he told the witness that if he sold any more of that soothing syrup he would be liable to a charge of murder; and if the case should come before him, he would take care that he should not be liberated on bail.

DELICACIES FOR THE SICK.

The following practical recipes from the *Druggists' Circular* will doubtless prove of use to many of our readers: —

CHICKEN JELLY.

Half a raw chicken, pounded with a mallet, bones and meat together;

Cold water to cover it well.

Heat slowly in a covered vessel, and let it simmer until the meat is in white rags and the liquid reduced one half; strain and press through a coarse cloth; season to taste, return to the fire, and simmer five minutes longer; skim when cool. Give to the patient cold, with unleavened wafers.

ARROWROOT WINE JELLY.

One cup of boiling water;
Two teaspoonfuls of arrowroot;
Two teaspoonfuls of white sugar;
One tablespoonful of brandy or three of wine.

Proceed as before. An excellent corrective for weak bowels.

ARROWROOT JELLY.

One cup of boiling water;
Two teaspoonfuls of Bermuda arrowroot;
One teaspoonful of lemon juice;
Two teaspoonfuls of white sugar.

Wet the arrowroot in a little cold water, and rub smooth; then stir into the hot water, which should be on the fire and actually boiling at the time, with the sugar already melted in it. Stir until clear, boiling steadily all the time, and add the lemon. Wet a cup in cold water, and pour in the jelly to form. Eat cold with sugar and cream.

FLAX-SEED LEMONADE.

Four tablespoonfuls of flax-seed (whole);
One quart of boiling water;
Juice of two lemons.

Pour the boiling water upon the flax-seed, and steep three hours in a covered vessel; sweeten to taste; if too thick, add cold water with the lemon juice. Ice for drinking. It is admirable for colds.

ICELAND MOSS JELLY.

One handful of moss, well washed;
One quart of boiling water;
The juice of two lemons;
One glass of wine;
One quarter of a teaspoonful of cinnamon.

Stir the moss (after soaking it an hour in a little cold water) into the boiling water, and simmer until it is dissolved; sweeten, flavor, and strain into moulds. Good for colds, and very nourishing.

Burnett's Flavoring Extracts. — *The superiority of these extracts consists in their perfect purity and great strength.* They are warranted free from the poisonous oils and acids which enter into the composition of many of the factitious fruit flavors now in the market. They are not only true to their names, but are prepared from fruits of the best quality, and are so highly concentrated that a comparatively small quantity only need be used.

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Familiar Science.

THE YEAR AND THE ALMANAC.

IT is unfortunate for the almanac makers that the day, or the time of the earth's rotation on her axis, is not an exact divisor of the year, or the time of her apparent revolution about the sun. If there had been just three hundred and sixty-five days in the year, it would have saved historians and chronologers a deal of trouble in keeping their reckoning. Even if the odd fragment of a day that goes to make up the precise year were a half or a third or a quarter or some other convenient fraction, it would be comparatively a simple problem to regulate the calendar so that it should not outrun or fall behind the steady movement of the natural year. But the mean excess of this year over the 365 days is 5 hours, 48 minutes, and about 46 seconds; or some eleven minutes less than quarter of a day.

"Call it a quarter, and let the petty eleven minutes go," one is tempted to say; "what are eleven minutes when you are measuring years?" That was Julius Cæsar's little mistake when he attempted to straighten out the almanac 1920 years ago; though if he had known precisely how much the fraction varied from a quarter he would perhaps have provided somehow for the difference. As it was, he called it a quarter, and "invented leap year" by adding an extra day to February — not at the end of the month, as we do, but by counting the sixth (*sextus*) day before the calends (or 1st) of March *twice* (*bissextus*, whence our *bissextile*). It was as if our almanacs for a leap year should duplicate the 24th of February, instead of adding the 29th.

This reformed calendar of Julius Cæsar's, with the year beginning January 1st and the length of the months arranged as in our modern almanacs, was a great improvement on its predecessors; but it soon got out of order, owing to a stupid misunderstanding of the terms of the decree establishing it. Cæsar meant that the leap year should be every fourth year, but the priests made it every third year. The consequence was that in the year 8 B. C., Augustus, finding that there had been three more leap years than there should have been, ordered that for the next twelve years there should be no bissextile. It appears to have been mainly on account of the good work they did in improving the calendar that Julius and Augustus were honored by having their names given to the months which had previously been known simply as the Fifth (*Quinctilis*) and the Sixth (*Sextilis*); that is, the fifth and the sixth from the old beginning of the year in March, as September, October, November, and December were the seventh, eight, ninth, and tenth.

But the calendar of the great Julius, though a marked advance on former ones, was not perfect. It had the seeds of disorder in its constitution, small and slow of growth, but destined in the lapse of centuries to become a serious mischief. Those miserable eleven minutes a year went on rolling themselves up into hours and days until the almanac and the sun were found to be at odds again. The vernal equinox came too early in March, and as the sun was presumably right, the calendar must be wrong. The Council of Nice in A. D. 325 brought the two into harmony once more, but left the cause of the evil untouched. The old accumulation of error was cancelled, but a new one began, which was allowed to go on undisturbed for more than twelve centuries. At length Pope Gregory XIII., finding that the calendar had got ahead of the sun ten whole days, determined to effect a radical cure. He therefore ordained that ten days, between October 4th and 15th, should be struck out of the year 1582; and, to prevent error in future, that three leap years should be omitted in four hundred years. This was neatly managed by making the omitted years the even hundreds that are not divisible by 400, or, as usually stated, not divisible by 4 after cutting off the last two figures. Thus, 1700, 1800, and 1900 are not leap years, while 1600 and 2000 are.

The Gregorian calendar was adopted in Italy, Spain, and Portugal on the day named in the pope's bull. In France, by an edict of Henry III., the 9th of December, 1582, was followed by the 20th. The Catholic portions of Switzerland, Germany, and the Netherlands made the correction in 1583, Poland in 1586, and Hungary in 1587. The Protestant parts of Europe, viewing it as a papal abomination, would none of it, but stuck to the old Julian reckoning for more than a century. At last, in 1700, Germany, Denmark, and Holland decided that a good thing was none the less a good thing because it had come out of Nazareth, and that even the pope might safely be followed in a civil reform. John Bull, with characteristic obstinacy, held out half a century longer, or until the year 1752. But the eleven minutes had now become eleven days, which must be ruthlessly sacrificed in squaring accounts with Father Time. This was done by dropping eleven days out of the month of September. In the English almanacs of 1752 the day next after the 2d of September is the 14th, and the month has only nineteen days.

It is a curious result of this correction of the calendar that the days from the 3d to the 13th of September, 1752, are a blank in British history. Nobody was born or died in England during that interval, nothing happened in high or humble life that can be found recorded in public annals or private journals. Of course there is a similar hiatus of ten days in October, 1582, in the chronicles of Italy and of Spain; while in those of France it appears in December of the same year.

A question naturally arises whether the Gregorian calendar can be warranted for all future time, or whether a further correction may hereafter be called for. It must be confessed that the average of the year under this revised arrangement is still some twenty-two seconds in excess of the mean solar year. The accumulation of this small fraction of time will amount to a day in about 3866 years. The French astronomer Delambre made the period 3600 years, and proposed that the years 3600, 7200, and other multiples of 3600 should not be leap years. The elder Herschel suggested that "every year divisible by 4000 without a remainder should consist of but 365 days; anything in the law established by Pope Gregory XIII. in 1582, or the act of the British Parliament in 1752 confirming the same, to the contrary notwithstanding." This would prevent time from getting out of tune for a thousand centuries to come. It is more exact than Delambre's plan, and 4000 is a simpler number than 3600 and readily associated in the memory with the 400 years provision of Pope Gregory. We do not, however, urge any rash haste in deciding the matter. There will be ample time for deliberation and discussion before A. D. 4000. A year or two before that date the JOURNAL will refer to the subject again, and if nothing occurs in the mean time to modify its views, it will probably take ground in favor of "the Herschel proviso." It is to be hoped that our Roman Catholic friends will not oppose it on the ground of its being a Protestant innovation. By that time we trust that such petty bigotry as kept the Gregorian calendar out of England for nearly two centuries, because the pope was its author, will be possible in no Christian land.

The change of dates from "Old Style," or the Julian reckoning, to "New Style," or our present Gregorian chronology, is a point on which there is some confusion in the minds of people, and it is often misexplained in books. The popular notion is that eleven days should be added to the old date, whether it be in the eighteenth or any earlier century. But we have seen that in 1582 an addition of ten days sufficed to correct the calendar, and that this difference was the accumulation of about 1250 years. The farther back we go, then, the fewer days must we add to make the date right. A slight calculation will determine the number for any given epoch.

A misapprehension on this point has more than once led to blunders in the celebration of anniversaries. Columbus discovered America on the 12th of October, 1492, according to the almanacs of the period; or on the 21st of the month, New Style (the error being then nine days), not the 23d, which has sometimes been commemorated as the day. The Pilgrims landed at Plymouth December 11, 1620, O. S., the modern anniversary of which is December 21st, not the long-celebrated 22d, as the error in 1620 was only ten days. In 1731 it had increased to eleven days, so that the 22d of February is now the correct representative of Washington's birthday, which was February 11th of that year.

We may add that, although by act of Parliament the day after the 2d of September became the 14th, the natural sequence of the days of the week was not changed. The 2d was Wednesday, but the 14th was Thursday, and not Monday, as it would have been had no change been made. It follows that calculations with regard to old and new style affect only the days of the month, and no correction is required for the days of the week.

THE USES OF OZONE.

In an article which appeared in the JOURNAL for February, 1871, the chemical nature of ozone was briefly explained, with the modes of preparing it for experimental purposes. We suggested at that time that if some means could be devised for generating ozone cheaply on a large scale, it would probably become of considerable importance in the arts. But, as Dr. Hoffman remarks in his recent report on the development of the chemical arts during the past ten years, "an industrial method of obtaining ozone is still an unfulfilled desideratum." Various processes of manufacturing it have been patented in Europe, but no one of them appears to have been practically successful.

If ozone could be cheaply made, it would be exceedingly valuable for bleaching. If it did not entirely supersede chlorine, it would be available in many cases where that agent cannot be employed. It is really ozone that does the work in the old process of grass-bleaching, in which case it is generated by the growth of the grass. It has been employed for twenty-five years past in bleaching ivory at Meyer's walking-stick factory in Hamburg, and more recently in other places. The ivory is immersed for weeks in volatile oils, exposed to the sunshine and air. The latter becomes ozonized in the process, and then effects the bleaching of the ivory.

A patent has recently been granted in England for the application of ozone to the production of acetic acid from alcohol, without fermentation. The ozone is obtained by blowing air through a flame and bringing it in contact with a current of alcohol. Whether the method will work well on a large scale remains to be seen.

In the nascent state ozone oxidizes nitrogen to nitric acid. It is in this way that the nitric acid which is found in the rain falling during a thunder-storm has been formed. The electrical action generates the ozone, and the ozone oxidizes the nitrogen of the air. At present nitric acid is manufactured from nitre, but if ozone could be economically made in large quantities it would doubtless be employed for preparing the acid in the direct synthetical way just mentioned.

In medicine ozone has long been employed to some extent, and if its therapeutical value were more clearly established the cost of its production would be no bar to its more extended use. On this point, however, there is still a disagreement among the doctors. The subject was earnestly discussed at a meeting of the Berlin Medical Society, about two years ago, when Lender maintained the efficacy of ozone in tuberculosis, rheumatism of the joints, asthma, gout, and sundry other diseases. He was opposed by Oscar Liebreich, who argued that a body so unstable as ozone would be decomposed in the respiratory organs before it could mingle with the blood, so that inhalations of ozone must be merely inhalations of ordinary oxygen. But the experiments of Dewar and MacKendrick, reported to the Royal Society of Edinburgh last year, seem to show that ozone has a decided physiological action. Oxygen ozonized by induction, and containing not more than 10 per cent. of ozone, killed, in about twenty minutes, mice and small birds which were made to inhale it. The respiration of the animals became slower, the pulse was enfeebled, and the blood throughout the body rendered venous. These phenomena were thought to be due to the great specific gravity of ozone, which exceeds that of carbonic acid, and retards its removal by diffusion from the blood. Other observers have found that ozone irritates the mucous membrane and exercises a destructive effect upon the tissues of the body. But, as we have said above, authorities are divided with regard to its therapeutical properties, and further investigations are necessary before the question can be settled.

Ozone has also been recommended as a disinfecting agent for the sick-room, and various methods of generating it for this purpose have been proposed, some of which have been mentioned in the JOURNAL. One, which commends itself for its simplicity, is by means of a mixture of the permanganate of potash and oxalic acid. Two spoonfuls of this in powder, moistened with double the quantity of water, a little more water being added every two hours, will emit ozone freely. Another method, even simpler, which is said to work well, is to dip a bunch or part of a bunch of common friction matches into water until they are thoroughly moistened, and then to expose them to the air in the room to be disinfected. It should be borne in mind that ozone rapidly oxidizes the metals in ordinary use, except gold and silver.

For the benefit of those who have not read the article of four years ago, mentioned above, it may be well to state that ozone is simply an "allotropic form" or modification of oxygen; just as plumbago and the diamond are forms of the same element, carbon. It differs remarkably in its properties from ordinary oxygen, being far more energetic in its action. It oxidizes many metals and other substances which the latter does not attack; indeed, it is to this fact that it owes its bleaching and disinfecting powers. Its specific gravity is greater than that of oxygen — just one half more, according to some authorities. It has also a characteristic odor, from which it gets its name, *ozone* being derived from the Greek word ὄζειν (*ozein*), meaning *to smell*. Every one who has worked an electrical machine has probably noticed this peculiar odor, which is caused in this instance by the conversion of the atmospheric oxygen into ozone by the electricity.

CONCERNING CHIMNEYS.

Whenever a building is burned the "reasoning being" who finds the fact stated in the morning paper is prone to shake his head wisely and enlighten the partner of his sorrows by muttering something about defective flues; at the same time feeling a sort of sickly longing to know whether the warmth which at that moment is so welcome to his back may not prove, some dark and windy night, a rampant devil of fire behind the screen of inoffensive lath and plaster. How few, among the many who use the terms, know the difference between a "defective" and an "effective" flue. "Major De Boots," of jovial memory, says to his landlady that "as his chimneys will only draw the wrong way he thinks turning them upside down might effect a cure." Chimneys, like everything else, should be brought within the domain of reason; and to reason to the purpose on any subject one must first have a certain knowledge of facts. The following hints are intended to apply only to ordinary dwelling-house chimneys, and even of those the consideration must be rather brief and general.

The products of combustion, so far as they affect the matter under consideration, are smoke and gases mingled with heated air, which would naturally ascend higher than the roofs of ordinary dwellings if not retarded by friction or stopped by an obstacle. Friction is generally caused by short crooks and bends and rough inner surfaces of the smoke channels. The most common obstacle is a downward current of air, the effect of a wind eddy caused by roofs or other elevations above the chimney top. Smoke ascends spirally; consequently the best channel for its passage would be round in section. The corners of square or rectangular flues are useless or worse; but still, if the inclosed space is large enough, they may be allowed on the score of economy in construction. The inner surfaces should be as smooth as practicable, to avoid friction and to furnish no lodging-places for soot; and the shaft should terminate in free air well above the roofs and other obstacles liable to create disturbing air currents. There is no more picturesque and hospitable-looking feature for a country house than a group of tall, well-arranged chimney stacks; even the necessary iron stays to make them entirely secure against wind may be so treated as to be a pleasing addition. The outer casing of flues should be of such thickness or material as will prevent the inner surface from being easily chilled or the outside heated enough to ignite wood-work, — although wood should *never* be placed in contact with a chimney.

The flues should be reasonably straight throughout their entire length, and sharp turns should be especially avoided. One will often suffice for several fires, but there is always a risk of some one of the fires not having sufficient draught. The only sure way is to have a separate channel for each fire. And even when this cannot be afforded, separate flues for furnace and range are indispensable. Chimneys are commonly built of brick, which is a reliable material if fairly used. The brick should all be "hard burned" and faithfully laid in good mortar with snug joints. Every flue should be at least eight inches square inside, and as small as this only where it is to be used for small stoves and occasional fires. Eight by twelve inches inside measure is the minimum for a regular flue. Inner surfaces should be smoothly and carefully plastered while the chimney is being built, and after the work has had a chance to dry and settle somewhat the entire outside surface should be carefully plastered, especial care being taken where the shaft passes through a floor or near wood-work. With these precautions the outside shell of the flue need be but a single brick (four inches) in thickness, except for range and furnace flues, where it is better for one story at least to build two

bricks (eight inches) in thickness. Of course no wood-work of any description or under any circumstances should be allowed to be within less than one inch of the brick-work. Every hearth for an open fire should rest on a brick trimmer arch, turned the whole width of hearth from the chimney to the opposite timber framed for the purpose. All openings for grates, etc., should have the brick-work supported by iron bars or brick arches. Where thimbles are set for stove-pipes there should be provision made to keep the plaster from cracking and bulging out, or the thimble being torn from its place. This may be done by using a patent thimble arranged to meet this particular case; or, in a more simple way, by setting the thimble nearly flush in the brick-work, plastering smoothly the face for about a foot square around it, and leaving this exposed as a square recessed panel in the wood-work of the chimney breast. Or the recess may be circular, about a foot in diameter, surrounded by a tin collar which shall abut against the smooth surface of a soap-stone thimble set in the chimney.

There are many patented and other arrangements of smoke flues, more or less valuable in various special cases, but so far we have treated only of the common and inexpensive form of brick chimney. One modification of the ordinary arrangement it will be well to consider, because it combines an extra safeguard against fire with a simple method of ventilation. The common vitrified or stoneware glazed drain pipe, of eight inches inside diameter and with the socket joint, makes an excellent flue; and if set in a rectangular casing of four-inch brick-work, with about an inch clear distance between the rim of the pipe and the casing at the nearest point, a space will be left all around which may be used for purposes of ventilation. Supposing there are several flues in the stack, whenever any one of them is heated by a fire it warms the air space between the outside casing and the pipe sufficiently to cause an upward current throughout the whole, and a ventilator set in any part of this casing, near the floor or ceiling of a room, will suck the air from the room by the use of the absolute mechanical force of heat. Of course every one does, or should, understand that air can only be moved by the application of force in some form. The double casing between the smoke flue and the wood-work makes an additional safeguard against fire. The only precaution necessary in using the stoneware flues is to avoid exposing them to the direct action of the flame of an open fire; which can easily be done by carrying up the throat of the flue a few feet with brick, before starting with the pipe.

It has been shown how flues may be built to prevent danger from fire and avoid imperfect draught. It is hardly necessary to dwell on the many and varied imperfections and defects of actual building. These belong rather to the province of the Sunday-school teacher, for they are generally the result of the criminal recklessness of masons and builders, who know or might know the right "but still the wrong pursue." Nine tenths of the chimney accidents are owing to the putting of wood into flues, or to nailing wood-work against flues too often built with soft brick with loose joints. The man who fires your house at midnight, if he has no friend at court, stands in danger of hanging. But the man who imposes on your confiding ignorance to induce you to trust your family to a fire-trap escapes unwhipped of justice. His only excuses, and those lame ones, are that he does as others in other departments of manufacture do, and that he builds as well as he is paid to. J. A. F.

NOTES AND MEMORANDA.

Sandal-Wood. — The sandal-wood out of which so many fans are made, and which is so much used on account of its strong scent, comes from a tree that attains maturity in about twenty-five years. The older the tree, the nearer the heartwood comes to the surface, while the bark becomes deeply wrinkled, is red underneath, and frequently bursts, disclosing in old specimens the absence of all sapwood. Such trees, whatever their size may be, should at once be felled, as they rapidly deteriorate. The heartwood is hard and heavy. The best parts are used for carving boxes, album-covers, desks, and other useful and ornamental articles. The roots, which are the richest in oil, and the chips go to the still, while Hindoos who can afford it show their wealth and their respect for their departed relatives by adding sticks of sandal-wood to the funeral pile. The wood, either in powder or rubbed up into a paste, is employed by all Brahmins in the pigments used in their distinguishing caste marks. The oil forms the basis of many scents, and is sometimes used for impregnating with its scent articles which, being really carved from common wood, are passed off as if made from true sandal.

The First Idea of the Telegraphic Dial. — In a work written by Father John Laurechon, a Jesuit, printed in 1624, at Pont-à-Mousson, under the title of "Récréation mathématique composée de plusieurs Problèmes plaisants et facétieux," there is to be found a curious passage, well deserving to be quoted: "It is stated that by means of a magnet, or any stone of the kind of loadstones, absent persons could communicate with each other; for example, Claudius being in Paris, and John in Rome, if each had a needle rubbed with some stone having the power, as one needle should move in Paris the other could move correspondingly at Rome; Claudius and John could have similar alphabets, and having arranged to communicate at a fixed time every day, when the needle had run three times and a half round the dial, this would be the signal that Claudius wished to speak to John and to no other. And supposing that Claudius wants to tell John that 'the king is at Paris,' he would move the needle to the letters, *t*, *h*, *e*, and so on. The needle of John agreeing with that of Claudius would, of course, move and stop at the same letters, and by such means they could easily understand and correspond with each other. This is a fine invention, but I do not believe there is in the world a loadstone having such a power; and besides, it would not be expedient, as then treason would be too frequent and too secret." Father Laurechon used to write under the assumed name of H. Van Etten. Annexed to the passage quoted, there is a diagram of a dial with the 24 letters, having the needle fixed at the letter A. A similar allusion is to be found in the Dialogues of Galileo.

A Thunderstorm the Cause of a Railway Collision. — How a thunderstorm was the "responsible party" in a railway collision is thus explained in a recent English journal: "The ten o'clock goods train from Wimbledon arrived at West Croydon shortly before twelve o'clock, having been considerably delayed by the weather, and was left standing below the station while some passenger trains were being shunted, when the twelve o'clock passenger train from Victoria, which goes round by Wimbledon, arrived at Waldon Marsh, where there is a signal station. The line is worked on the block system, and as the electric indicator showed that the line farther on was blocked, the train was stopped, and the driver waited the signal from West Croydon to go on. The train had remained stationary about five minutes when, directly after a vivid flash of lightning, the arm of the indicator dropped and the bell inside the signal-box rang, as is usual when an electric message is received. The line being thus signalled 'clear,' as was believed from West Croydon, the signal-man ordered the driver to go on, which he did; but on the train rounding a curve a short distance on, he perceived the goods train on the line directly in front of him. He endeavored to stop the train, but was unsuccessful, and the fore part of the passenger train ran into the rear of the goods train. Fortunately, however, the damage occasioned was but slight. The guard of the passenger train received a few contusions, but no bones were broken. The brake-van of the goods train was slightly injured, but the passenger train sustained little or no damage by the collision. It has been ascertained, it is said, beyond doubt, that the accident was entirely due to the action of the lightning on the signalling apparatus."

Curious Facts concerning Brain Injuries. — Delicate as the organization of the brain must be, it is surprising to read of the hard knocks it can bear, not only without injury, but even to its advantage. One man who lost half his brain, through suppuration of the skull, preserved his intellectual faculties to the day of his death; and the brains of soldiers have been known to carry bullets without apparent inconvenience, and to undergo operation for the extraction of the foreign bodies without loss of power. A physician, who was afflicted with an abnormal cerebral growth which pressed upon the cavities of the brain, so as to paralyze one side of his body, and render him speechless, retained possession of his reasoning and calculating powers until he died. One of three brothers, all idiots, after receiving a severe injury on the head, gained his senses, and lived to be a clever barrister. A stable boy of dull capacity, and subjects to fits, had his wits sharpened by the kick of a horse, which necessitated the abstraction of a portion of his brain; and Pope Clement VI. owed the improvement of his memory to a slight concussion of the brain. On the other hand, it is a fact that the brains of persons with thoroughly disordered minds as a rule present no abnormal condition after death, which is not to be wondered at when it is found that symptoms of a disordered brain are often produced by a very slight alteration in the constitution of blood.

The Human Body rendered Luminous by Phosphoretted Hydrogen. — Dr. George Maclean, of Princeton, N. J., writes to the editor of *Silliman's Journal* as follows: "Several years ago, after spending a portion of the day in experimenting with this gas (PH_3), prepared from phosphorus and solution of potash, on retiring to bed I found my body quite luminous, from a glow like that of phosphorus exposed to the air. Either some of the gas escaped combustion, or the product of its burning must have been absorbed into the system and the phosphorus afterwards separated at the surface have there undergone eremacausis. I was conscious of no feeling that could be attributed to it, nor was my health apparently in any way affected by it."

A repetition of the trial would probably reproduce the results observed by Dr. Maclean, which have apparently escaped notice because unsought.

THE HUMORS OF SCIENCE.

The Pursuit of Science under Difficulties. — *L'Union Médicale* gives an amusing account of the interference of the French police with one of the excursions made by members of the Sci-

entific Association during their recent annual meeting at Nantes. It appears that four members of the anthropological section set out to explore the banks of the Lake of Grandlieu, and had occasion to make many inquiries, and to consult the communal plans of the country. A gendarme, considering that these procedures had a very suspicious appearance, demanded of the party their papers. The Secretary of the St. Petersburg Geographical Society, who was one of them, at once displayed a Russian passport with a German translation, which, however, had not the smallest effect on the gendarme, who also, pronouncing the cards of the association which were produced by the others as still less satisfactory, marched the whole party off to his brigadier. This functionary, after a tedious examination of all the proofs advanced, pronounced his judgment: "You are quite out of order, but as I do not find an actual *délit* in your case, I restore you to your freedom of action." It seems that the arrest of *savants* during their excursions takes place in France oftener than might be expected, and is not always so promptly terminated. Some time since, a professor of geology in an important faculty was not only arrested, but imprisoned, and was only extricated next day with great difficulty by means of the telegrams of the dean of the faculty.

What they Know about Whales in Wales. — We find the following in *Iron:* Mr. William Morgan, Ph. D., F. C. S., public analyst for Swansea, has — if he is correctly reported in the local papers — made the remarkable discovery that the whale is not a fish, as ignorant persons suppose, neither is it a mammal, as educated persons imagine, but that this perplexing creature is even lower in the scale of creation, being, like coal, the source of a mineral oil, and therefore, like coal, a mineral. An engine driver being charged with stealing some oil, Mr. Morgan, Ph. D., etc., appears to have been called as a witness to say something about the identity of certain samples of oil. In answer to the question, "What is train-oil?" he made the candid reply, "I don't know," subsequently qualified by the remark that it was a vegetable oil. After consulting a book, however, he discovered that he had made a mistake, and said — we quote from the *Western Mail:* —

"I wish to correct myself; I find here that train-oil is taken from a whale.

"Chairman: Then it is not a vegetable oil?

"Witness: No, a mineral.

"The witness was closely cross-examined by Mr. Dunn, and stated that he knew all along that train-oil was a mineral oil, but he got confused. He did not know that the Esquimaux were fond of train-oil, but he knew that the component parts of the oil were carbon, hydrogen, and oxygen."

HOUSEHOLD HINTS.

Curry Powder. — The London *Chemist and Druggist* says: "We had the following recipe from a native Indian, and we believe it to yield a fine product. The powders must be fresh and of the best quality: —

Coriander, fresh seed, roasted but not burnt, and finely powdered	2 lbs.
Turmeric, fresh root, ditto, ditto	¾ lb.
Fenugreek, fresh seed, ditto, ditto	8 ozs.
Mustard seed, ditto, ditto	8 ozs.
Cummin seed, ditto, ditto	¾ lb.

To this add cayenne pepper according to taste."

A Hint for the Laundry. — The following is from *Harper's Bazar:* A tablespoonful of black pepper put in the first water in which gray and buff linens are washed will keep them from spotting. It will also keep the colors of black or colored cambrics or muslins from running, and does not harden the water. A little gum arabic imparts a gloss to ordinary starch.

Practical Chemistry and the Arts.

FROZEN MEAT.

Our English cousins are just now elated at the prospect of securing plenty of fresh meat in a frozen state from Australia. The method of preparing the meat and shipping it to England has been fully described in the Melbourne newspapers.

The process is very simple, and we cannot see why it may not succeed. The refrigerating process is effected in two large apartments, each about 75 feet square and 9½ feet high, called respectively the cooling-room and the freezing-room, the latter being underneath the former. These apartments are entered only through trap-doors from above. They are inclosed by walls 4½ feet thick, built of brick, but constructed so as to contain two or three hollow spaces, one of which is filled with a material known to be a bad conductor of heat. Each of these apartments will hold, when closely packed, over a thousand tons of meat. The cooling-room will be used for the storage of meat intended for home consumption, which will not be actually frozen, but merely reduced to so low a temperature that it will keep sweet for any time, until it is wanted. The freezing-room below, however, is intended for the reception of meat designed for exportation. The temperature of this room will always be kept considerably below freezing point, as low even as zero, and the meat here is frozen perfectly hard, so that if struck by the knuckles it feels like solid wood, and emits a similar sound. Meat kept in this condition, it is needless to say, will remain good practically forever. This meat it is intended to ship to Europe and elsewhere, the holds of the vessels being prepared after a principle similar to that of the refrigerating machines intended for household use, so that the meat will remain in its frozen state until it reaches the foreign markets.

Not the least surprising feature of this system is the economy with which it can be worked, for it is calculated that about one penny per pound will cover all charges attendant upon this mode of preserving meat, including even the cost of transportation to England. The means by which the cold necessary for the preserving process is obtained is by the application of certain well-known chemical principles. The machinery used for effecting the freezing process is the invention of Mr. Nicolle, and is an improvement upon the apparatus invented by the same gentleman which has for some time past been used at the Sydney Ice Works. There the principal agent used was absolute ammonia, which necessitated the use of a very high pressure to bring it from the gaseous to the liquid state, and therefore was subject to considerable inconvenience and risk of loss by leakage. Here, the ammonia is used in a strong solution, under a pressure of only from 50 to 70 lbs. to the square inch, while at the same time the power of the machine is very much increased. The machinery, which appears complex, is really simple, so much so that it requires only the aid of two persons to work it — one to fire, and the other to watch and regulate the apparatus. By means of a most ingenious adaptation of means to the end, the same ammonia, after having been used to produce the cold, is reabsorbed, and made to do duty again, so that there is absolutely no waste beyond an inevitable minimum from leakage, and a constant circulation of liquid is continually going on, just as the blood, after having passed through the human arteries, returns by the veins into the heart and lungs, and is made to traverse the "natural gates and alleys of the body" again and again.

The intense cold required for preserving the meat is produced in the freezing-room, by means of a liquid which freezes at a very much lower temperature than water. This liquid, having been cooled to a sufficient degree in the freezing cisterns, is pumped through a series of metal tubes covering almost the whole of the ceiling of the freezing-room. The heat, naturally rising, is thus absorbed and carried off, until the room is cooled to whatever extent may be required; and the walls being almost impervious to heat, it is then comparatively easy to keep the temperature low, especially as there is not the slightest current of air flowing through the room. There is, however, an air-pump apparatus, by means of which fresh air can be introduced into the apartment, whenever it is necessary, for the purpose of ventilation, the outgoing exchanging its cold with the ingoing air. In several instances this room has been utilized for the public good, as in the case of the carcass of a goat, which it was desirable to preserve as evidence against a man charged with cruelly torturing the poor animal. This was kept in the freezing-room until the case came before the magistrates, when the carcass was produced in a perfectly sound condition, and so became incontrovertible evidence against the perpetrator of the inhuman deed.

The visitor to the freezing-room is struck by the fact that there is nothing oppressive in the intense cold of that apartment, which is doubtless owing to the stillness of the atmosphere. He will also notice that whatever moisture there might have been in the atmosphere is condensed on the cooling pipes against the ceiling, where it glitters and sparkles like the diamonds in a fairy grotto.

NEW THINGS IN THE ARTS.

Dried Potatoes. — A German journal, *Der Landwirth*, thus describes the manufacture of "dried potatoes" as conducted at Carsten's works in Lubeck: The potatoes are peeled with the hand, and cut into disks by a machine. These are put in a basket, and this in a boiler, where the potatoes are nearly but not quite boiled. The disks are next put on wire frames in a dry oven, where they are dried quite hard. It is important to preserve the color of the potatoes, and to prevent their turning gray, as they would by the above process alone, the material after slicing is treated with cold water, to which has been added 1 per cent. of sulphuric acid, or 1 to 2 per cent. of muriatic acid. Then it is washed in pure water, and the drying proceeds. The preparation obtained, which has lost none of its starch, is of a slightly citron-yellow tint, and transparent like gum. Boiled with water and a little salt, it is said to resume the natural color and fibrous structure of potatoes, and is not distinguishable in taste from newly boiled potatoes.

A New Specific Gravity Balance. — We notice in *Silliman's Journal* a description of a new instrument devised by Mr. Roswell Parish, of Worcester, for the determination of the specific gravities of minerals and other solids heavier than water, without the use of exact weights and without math-

ematical computation. It consists of a standard and a scale-beam with unequal arms, from the shorter of which is suspended a pair of scale pans or baskets, one above the other, the lower immersed in water. The mineral is placed in the upper basket and is counterpoised by a sufficient weight suspended by a fine wire loop at the extremity of the longer arm. Then the mineral is transferred to the lower basket, and the counterpoise is moved toward the standard until the equilibrium is restored. It will be seen that the length of the long arm is to the distance through which the counterpoise is moved as the weight of the mineral is to the weight of the water displaced. This ratio between the length of the arm and the distance of a given point upon it from its outer extremity is indicated at that point; so that the specific gravity may be read off directly from the scale-beam. The instrument is simple and easily managed, and gives as accurate results as a much more expensive balance with exact weights.

Microscopic Maps. — It will be remembered that during the siege of Paris a good deal was done in the sending of photographically-reduced dispatches by balloons. The inventor of the method of reduction, M. Dagron, has lately applied it to the production of maps. In this way, the whole official map of France is brought into a form that can be easily carried in a pocket-book; and maps of all the countries of Europe are arranged to be carried on a cartridge-belt along with the magnifying apparatus, or "telemeter," by means of which all the details of the original map are greatly enlarged, and can be easily studied. In darkness, the light of a match, or even the glowing of a cigar, suffices to enable one to read off the map at once. The French anticipate that these maps will prove very serviceable in case of war, as also for educational purposes.

A New Use for Seaweeds. — The London *Art Journal* says: "Another attempt on the part of ladies to be self-helpers demands a brief record. A Miss James has conceived the idea of converting seaweeds into the semblance of graceful flowers, by certain aids from colors and by an ingenious moulding of natural forms. Seaweeds, dried, have long been favorites in albums, and few who spend an autumn month at marine localities neglect opportunities to gather and preserve them; but to wear them in hats or caps, or as hair ornaments, is, we believe, a novelty; at least, until now, we have never seen an effort of the kind. It is not easy to describe the effect Miss James produces. At a distance the seaweeds seem artificial flowers made from muslin or wax; examined nearer they are very striking. Sometimes there is added to them the sparkle of small shells. If some lady-leader of fashion would wear a group or two she might introduce a new and very graceful mode of employing ladies, doing a large good and no harm, and aiding to abolish an atrocious custom — that of destroying beautiful birds in order to obtain means of decoration. A lady who adopts and supports that evil practice should find it difficult to be selected as a wife."

Lighting Mills by Electricity. — We learn from the *Electrical News* that the electric light has recently been applied for lighting the mills belonging to Messrs. Heilmann, Ducommun, and Steinlein, in Mülhausen. In a separate room four magneto-electric machines are placed, which feed four suitably located lamps constructed on the Serrin principle. The dimensions of the room so lighted are 60 metres (196.8 feet) by 30 metres (98.4 feet). Each lamp gives a light equal to about 100 Carcel lamps. Each magneto-electric machine requires about 50 kilogrammetres (360.8 foot-pounds) of motive power. The cost of the four lamps, exclusive of the maintenance of the motive power, averages about 20 cents per hour. The magneto-electric machines have each cost 1500 francs ($300), the whole arrangement amounting to 8000 francs, or $1600.

PRACTICAL RECIPES.

Mucilage for Minerals, etc. — Mr. F. C. Hill, of the Geological Museum, Princeton, N. J., writes to the *Journal of Pharmacy* as follows: "My friend Professor R. P. Whitfield, of Albany, N. Y., was good enough to give me the following recipe for mucilage to mend fossils and minerals, and, after several months of experience with it in the museum, I find it so valuable that, with his permission, I send it for the benefit of the readers of your journal: —

Starch	2 dr.
White sugar	1 oz.
Gum arabic	2 dr.
Water	q. s.

"Dissolve the gum, add the sugar, and boil *until the starch is cooked.*

"Professor Whitfield is in the habit of drying it into sheets, on paper, and re-dissolving when wanted. He does not claim to have originated the recipe, but thinks it is one of the compositions offered to the United States government for gumming stamps.

"It is certainly a very adhesive mucilage, and, owing to the sugar, never becomes brittle; so that it never scales off, as most glues do, from stones or other hard substances. In a geological cabinet, it is simply invaluable."

Brown Oak Stain. — Prepare the wood with a solution of 1 oz. catechu, boiled in 1½ pints of water. When dry, brush over a solution of bichromate of potash, 1 oz. to 1½ pints of water. By varying the proportions different shades may be obtained.

Violet Fire. — A correspondent of the *English Mechanic* gives this formula for a violet fire: Take 4 oz. of nitre, 2 oz. of sulphur, and 1 oz. of sulphide of antimony. These, in powder, should be well mixed in a mortar. There is no risk in making or keeping these ingredients together.

Agriculture.

THE MASSACHUSETTS STATE BOARD OF AGRICULTURE.

The annual meeting of the State board was held at Haverhill during three days, ending December 2d. The meetings were of great interest, and many distinguished farmers and patrons of husbandry were present from various sections of the State, who took part in the discussions. Lectures were given by Professor Stockbridge of the Agricultural College, President Chadbourne of Williams College, Secretary Flint, George B. Emerson, Esq., Rev. Mr. Murray of Boston, and the editor of the Journal.

The exceeding cold weather prevented a large number from being present; still the attendance was quite as good as usual at these meetings. The lectures and discussions took a wide range, embracing a variety of topics directly or indirectly connected with husbandry, all of which have been quite fairly reported in the newspapers, and in revised form will appear in the State report. The Massachusetts Agricultural Report is a very valuable document, and every farmer in the State should secure a copy if possible. The topic we selected for a "talk," on Wednesday P. M., December 1st, was "Boulder Rocks, their probable Origin and History, and their Use in the Construction of Buildings." In a future number we shall present some portions of the lecture not heretofore alluded to in the Journal.

THE COLD WAVE.

The wave of cold that rolled over the Northern States and New England on the last day of November was extraordinary in several particulars. The intensity of the cold and the suddenness with which it came were unparalleled. In twelve hours the thermometer sunk 45°, going as low as 6° below zero. Such meteorological changes cause great damage to farmers. The ground, unprotected by snow, and the roots of plants lying in the warm earth, are frozen suddenly and thus thrown to the surface, and often broken by the expansion of the soil. Grass roots suffer particularly, and grapes also. Besides the injury to the fields and orchards, fences are moved, and often buildings. Animals as well as human beings suffer from the rapid transition, and every careful farmer will at such times give his animals special attention. The flow of milk is diminished in cows, this secretion being the most sensitive of any in the organism of animals We must do all we can to mitigate the mischief of these cold waves; it is certain we cannot prevent them.

ASPARAGUS.

This delicious vegetable is receiving much attention at the present time, not only from market gardeners, but from farmers generally, who are desirous of having it for use in their own families. At the recent meeting of the State Board of Agriculture at Haverhill, we asked Mr. Slade, an extensive cultivator of the plant, if he was satisfied that there is really but one variety, and that the difference in the size results from cultivation. He replied that he was. We are inclined to think this conclusion to be correct. The plant comes from the wild variety, which grows freely in England and Italy. It may be indigenous to this country, but we do not know of localities where the wild plant is found. Pliny states that asparagus, which formerly grew wild so that every man might gather it, was in his time carefully cherished in gardens, particularly at Ravenna, where the cultivated plant was so large that *three heads would weigh a pound.* If this is true, the ancient Roman gardeners beat us most decidedly, for with our *colossal* and other varieties, we have not attained to a size approaching this. The English and the Dutch cultivators have, however, produced enormous plants. Evelyn, in his "Acetaria" (1699), says that "next to flesh nothing is so nourishing as sparagus; it was sometimes eaten raw with oil and vinegar, but was more delicate if speedily boiled, so as not to lose its color." He tells us that he did not think the large Dutch kind, "which was raised in highly manured beds, so sweet and agreeable as those of moderate size, and yet to show what solum, cœlum, and industry will effect, the honorable and learned Charles Hatton made my wife a present of 16 sparagus, the whole bundle containing only sixty, weight 15 lb. and ¼. So allowing 4 oz. to each sparagus, one was as much as one would desire to eat, and what was most observable, they were not raised or forced by any extraordinary compost, but grown in a more natural, sweet, rich, and well-cultivated soil about Battersea." Miller, in his "Dictionary," states that a friend of his procured some seed of the wild kind, which he cultivated with great care in very rich ground, yet could not get the roots to produce a stem more than half the size of the garden kind which grew on the same bed, but he always found the wild sort came up

ten days or a week earlier in the spring, and the shoots were exceeedingly sweet. Leonard Meager, in his "English Gardener," published in 1683, informs us that in his time the London market was well supplied with forced asparagus; the method employed was placing the roots on warm manure-beds. A Mr. Grayson, of Mortlake, once produced a hundred heads that weighed 42 lbs. We read in Keysler's "Travels" that at Darmstadt, in 1730, very large asparagus was grown; the heads of some weighed half a pound; several hundreds of these heads were sent as a present to the Elector Palatine.

The asparagus trade in France is becoming of more importance every year. The principal seat of its culture near Paris is Argenteuil, from which place in 1820 about five thousand bundles were sent to the market, but now the produce probably exceeds a million. It is grown to a very great size, the maximum attained at the present time being eight inches in circumference; but a dish of such grass costs 40 to 50 francs. In the south of France this vegetable is frequently grown between the vines.

The wild asparagus is found in many parts of Europe where the soil is light and contains an amount of salt, which appears to be necessary for this plant. The salt steppes of Russia, Mr. Loudon tells us, are covered with it, and horses and oxen eat it like grass. In England it is found growing in Cornwall, also on the western and southwestern coast.

Antonie Mizold, in the seventh century, states that if the root is put on a tooth that aches violently, it causes it to come out without pain. The sprouts contain a peculiar crystalline substance, called asparagine, which was formerly used in medicine, but is not now retained in the Pharmacopœia. Sometimes a decoction of the root is given as a diuretic in dropsies.

Loudon states that the flower-stalks of *Ornithogalum* are used in some parts of Gloucestershire, and sold in Bath under the name of Prussian asparagus; also the stalks of "salsify." The midrib of the beet is sometimes dressed as this vegetable, and the young buds of the hop are said to be scarcely inferior in taste. The tender shoots of the typha, a kind of reed, are eaten by the Cossacks like asparagus. Under the general name of asparagus the ancients were accustomed to class all young sprouts of vegetables which were used in that state. The word is Greek, signifying a young shoot before it unfolds its leaves. Parkinson says that our old English writers "called asparagus 'sperage;' when these names were vilely corrupted into '*sparrow*-grass,' and thence frittered down into 'grass,' I am unable to say." Batty Langley ("Principles of Gardening," published 1728) says, "The top of the bud is of the form of a sparrow's bill, and from thence is vulgarly called 'sparrow-grass.'" In Low Dutch it is called "coralcrunt," or *Herba coralli*, that is, coral-wort, from its red berries, the seeds of which have been recommended as a substitute for coffee. The young plants grown in pots make beautiful decorations for the parlor or dining-table.

STRIKING CUTTINGS IN SAWDUST.

Mr. J. F. Roberts, of the Horticultural Improvement Society, Melbourne, writes to *The Garden*: "I have been in the habit of practising M. Truffaut's plan of striking cuttings in sawdust more than twenty years in the colonies, and it was known to me some time before I left England, accident being the discoverer. I casually placed some cuttings of a cucumber, which I intended to strike for winter forcing, in a bed of sawdust that I had used for forcing roses, lily of the valley, etc., for the conservatory, with a hot-water tank underneath, and these being partially neglected for a few days I observed that the cuttings kept fresh, and on examination I found them to be splendidly rooted; I therefore afterwards occasionally used it for striking cuttings, which I found invariably to grow, but I did not like it much after all, as it induced a kind of fungus to grow on the roots. However, twenty years ago, while in a nursery at Adelaide, having no other article for plunging pots in my propagating-house, I used sawdust. It again occurred to me to try my former experiment, and I was so satisfied that I used it for cuttings of every description with great success. I extended my experiments still further in the Botanic Gardens, Adelaide, where I found that all ordinary plants struck root in it readily, and that I was not only able to strike all classes of stove plants in it but even camellias, heaths, azaleas, beronias, correas, epacrises, and indeed most of our hard-wooded New Holland plants. I must not omit to state that the sawdust was nearly decayed, with a scattering of silver sand in it 6 or 8 inches deep; I also found it necessary to keep up a regular gentle heat in order to insure success; the evaporation from the tank below (after the sawdust is once wet) produces, with an occasional light syringing overhead, a sufficiency of moisture for the roots. For all hard-wooded plants I invariably use bell-glasses; for soft-wooded and bedding plants sawdust is invaluable, as they strike in it and are ready for potting off in an incredibly short time. I have even used it for striking begonia and gloxinia leaves, starting caladium roots, dahlias, etc., with the best results. The temperature of the sawdust bed should be from 70° to 75°."

GLEANINGS IN FOREIGN FIELDS.

"Bumble-Bees" for the Antipodes. — The study of the relations of insects to plants has not been without practical advantage to agriculture. Early in October, as we learn from *Nature*, two nests of English humble-bees were sent to New Zealand by Mr. Frank Buckland, for the Canterbury Acclimatization Society. These insects are specially desired in New Zealand for the purpose of fertilizing the common clover; the proboscis of the common bee is not sufficiently long to reach down to the pollen of the clover flower, while the humble-bee's is enabled to do so. In this way the insect is expected to do great service to the agriculturist by largely extending the growth of the clover. The bees were packed in their own nests in two boxes, and will be under the charge of a member of the New Zealand Council, who is provided with every necessary for their welfare during the voyage. They are expected to arrive about the middle of January — midsummer at the antipodes.

How Yankee Potatoes do in England. — The *Standard*, of Coventry, England, states that last spring one pound each of the Snowflake and Eureka potatoes, two new American varieties, were planted in the gardens at Capesthorne, the seat of Mr. Bromley-Davenport, M. P. On the 13th of September the Snowflake was lifted, when it was found that the one pound had produced the surprising weight of 638 pounds. A week later the Eureka was lifted, and it was ascertained that the pound of seed potatoes had produced 1082½ pounds, the largest yield on record. Three hundred of the tubers weighed 369½ pounds.

The Cultivation of Truffles in France. — Large tracts of land in the south of France, not hitherto cultivated, are being planted with the kind of oak-trees beneath which truffles are generally found, and it is expected that each acre of this land, lately sold as low as $25, will yield a crop of truffles worth $100 per year. The experiment has already been tried in the department of the Vaucluse, and in the course of the last twenty years, 150,000 acres, which were absolutely unproductive, have been planted, and are yielding a rich return. The cost of plantation, which is borne by the commune, does not exceed twenty francs per acre on hilly ground, and though rather greater in the lowlands, the crops are proportionately heavier. Acorns only are planted on the hilly ground, but saplings of five or six years' growth, placed in rows about forty feet apart, are found to answer best in the lowlands. The ground between the rows of trees is planted with vines, which, after five or six years, repay the cost of the plantation and its culture.

A Pyrotechnic Plant. — A correspondent of the London *Gardener's Chronicle*, in a description of the flower-gardens of Ghent, says: "Interspersed among these novelties are specimens of the old fire-work plant, *Pilea callitrichoides*, which have to take a bath four or five times a day, for the amusement of non-botanical visitors. Some gardeners call it 'Sebastopol,' although it was cultivated before Sebastopol was thought of as a point of attack. Those who do not know it should, as it is of easy growth and very amusing. During the hot months of summer it is covered with flower-buds, like large pins' heads produced in succession. Plunge the head of the plant in a pail of water, shake it, to get rid of the superabundant moisture, and a minute or two afterwards the buds explode with a noise which, if audible to insect ears, is not so to ours, scattering little whiffs of smoke-like pollen, and darting forth four stamens, which then form a tiny white Maltese cross. It is pyrotechny which sets fire to nothing and can hardly frighten anybody."

Value of Trees in Towns. — Mr. Griffiths, the medical officer of health for Sheffield, England, in his report upon the sanitary condition of that town during 1874, makes the following interesting remarks in reference to street trees: "In the formation of new streets, and on the eve of the contemplated widening and alteration of old ones, it is to be hoped that an effort may be made to provide for the planting and establishment of trees wherever practicable. The pleasing appearance of verdure in summer, and the agreeableness of the shade afforded by the foliage to pedestrians, are benefits to the inhabitants well worth the effort and the cost. Whoever has visited the boulevards of Continental towns, or even the squares of London, can testify to the advantages of verdure as offering pleasure to the eye and gratification to the mind. Moreover, from a sanitary point of view, the benefits are of incalculable value. It has been asserted that the aggregate surfaces of the leaves of well-grown elm, lime, and sycamore trees, with their 6,000,000 to 7,000,000 leaves, equal about 200,000 square feet, or about 5 acres; and these are almost constantly absorbing and digesting the carbonic acid and various exhalations given off by the putrefaction of animal and vegetable matter, and, as if grateful for such support, return into the air pure oxygen, which reinvigorates and renews animal life. Trees thus remove poison from our midst, and to be without them is an oversight. Trees can be had which will exist, with suitable attention, in any part of the city. Why not, with all the above facts before us, have them and try them?"

Leigh Hunt's Prison Garden. — Leigh Hunt was imprisoned for debt in Horsemonger Jail, but being in extremely delicate health he was removed to the infirmary. In his "Autobiography," after describing his quarters, he adds: "But I possessed another surprise, which was a garden. There was a little yard outside the room railed off from an-

other belonging to the neighboring ward. This yard I shut in with green palings, bordered it with a thick bed of earth from a nursery, and even contrived to have a grass plot. The earth I filled with flowers and young trees. As to my flowers, they were allowed to be perfect; and Thomas Moore, who came to see me with Lord Byron, told me he had never seen heartsease like mine. Here I wrote and read in fine weather, sometimes under an awning. In autumn my trellises were hung with scarlet runners, which added to the flowery investment."

A New Mode of Treating Cows whose Milk does not yield Butter. — In the reports of the government veterinary surgeons of Brabant, Belgium, we observe that M. Deschrynmaekers mentions a mode of treating cattle whose milk does not yield butter, and which he asserts has never failed. He prepares the following compound: sulphate of soda, 300 grammes; oak bark, 12 grammes. This is divided into three doses, and to each dose is added half a litre of vinegar and salt water. A dose is given in the morning fasting. It is never necessary to repeat the treatment.

Prices of Rare Plants in England. — In London, last month, a collection of orchids, consisting of 639 lots, brought £2211 14s., or more than $11,000. One plant of *Saccolabium guttatum*, described in the catalogue as being "from 2 to 3 feet high and wide," and as having "twenty-two strong leaves, two strong young plants at bottom, with ten and eleven leaves respectively," and as having "produced ten spikes of bloom this year," was sold for £65 2s. (about $325). Twenty, thirty, and forty pounds were freely given for other lots, few of which brought less than ten guineas.

Cheap Houses. — An Englishman, writing to the London *Spectator* from Southern California, says: "A house here does not cost anything to many people in the summer, for the simple reason that they do not have one; and in the rainy season one can be built that will do very well for £5. I saw a man the other day sitting on a chair at a table eating his dinner under a tree, with a stove on one side and a bedstead on the other, and all the furniture of a house around him, and not a house within five miles, and he looked very jolly. I have heard of houses without fire-places; but I was rather surprised the other day when I came upon a neat fireplace, with a good chimney and everything, and no house. This life agrees very well with my health, and, in spite of hard work, etc., I rapidly increase in weight."

A New Insect Powder. — The *Industrie Blätter* of Berlin recommends the use of the *Ledum palustre* (which does not differ essentially from the *Ledum latifolium*, or "Labrador Tea," which grows in mountain districts of North America "from Pennsylvania to Greenland") as a substitute for the well-known Persian powder. This plant, whether fresh or dry, will kill lice, bedbugs, fleas, moths, beetles and their larvæ, the maggots and blue-bottles, and probably other insects. It is also the best remedy for mosquito-bites, and the bites of all other insects. A little of the tincture of the plant applied to the bite not only checks the intolerable itching, but also relieves the pain. If the tincture be mixed with glycerine and rubbed on the skin, it will drive the mosquitoes away. If this be a fact, the plant deserves special attention.

What is an Inch of Rain? — An English acre consists of 6,272,640 square inches; and an inch deep of rain on an acre yields 6,272,640 cubic inches of water, which at 277.274 cubic inches to the gallon makes 22,622.5 gallons; and as a gallon of distilled water weighs 10 lbs., the rainfall on an acre is 226,225 lbs. avoirdupois; counting 2240 lbs. as a ton, an inch deep of rain weighs 100.993 tons, or nearly 101 tons per acre. For every hundredth of an inch a ton of water falls per acre.

Boston Journal of Chemistry.

Jas. R. Nichols, M. D., *Editor.*
Wm. J. Rolfe, A. M., *Associate Editor.*

BOSTON, JANUARY 1, 1876.

THE RELATION OF BATTLES TO STORMS.

It has been observed for many centuries that storms, or meteorological changes of a striking nature, occur during or at the close of great battles. Whether these results are to be regarded as coincidences, or as the sequence of physical disturbances in the atmosphere, is a question not decisively settled. Of the fact that storms do occur in close connection with battles there is no doubt. During the late war in this country, hardly an action of any magnitude took place, which was not accompanied with wind and rain. The operations on the Peninsula under McClellan were apparently productive of continuous rains, and in the great fights around Richmond and Petersburg meteorological disturbances occurred which at times seriously impeded military operations. So too abroad. The loss of the great battle of Solferino was attributed by the Austrian commander to a terrific thunder-storm which burst over the field and obscured movements of powerful masses of the enemy. The decisive battle of Sadowa, which closed the Austro-Prussian war in 1866, was in like manner accompanied by a violent storm. Napoleon was heard to remark that so certain was he of causing rain by the explosions of his artillery during battles, that he disposed his troops in a way to take advantage of clouds when they formed.

No reasonable objection can be urged against the theory that great explosions, producing violent concussions in the air, may change its hygrometric conditions and cause condensation of moisture. Beside the disruptive effects produced in a great battle, there is the evolution of much heat, from the combustion of gunpowder and from the massing together of large bodies of men. Altogether, it is not difficult to find satisfactory causes for sudden meteorological changes during great battles, and therefore wind and rain are not to be regarded as simply coincident with active proceedings in war. It may be urged that our national anniversary, the Fourth of July, is usually clear, notwithstanding the vast amounts of gunpowder burned in all parts of the country. This does not, however, meet the case; the explosions occur all over the country and are comparatively upon a small scale. There is not usually a decided concentration of noise at any one point. If this occurs, a shower is pretty certain to take place. Last year the day was particularly noisy in Eastern Massachusetts, and in the afternoon the most violent thunder-storm of the season burst over that section of country. The question is one of much interest to meteorologists, and is worthy of more careful consideration than it has received.

THE METRIC SYSTEM.

The expediency of the general introduction of the metric system of weights and measures into this country is being discussed just now with renewed interest in both technical and popular journals. The majority are in favor of the movement, and the good time for it seems really to be coming. The "Centennial" year might well have the credit of so sensible a reform added to its other prospective honors and glories. We might urge, indeed, that the very idea of a centennial epoch belongs to the metric or decimal system of reckoning. It is solely on account of our familiarity with that scale of counting that a century, or ten times ten years, has any more significance than eight times eight years, or any other number. The century and the simple divisions of the century are the basis of most of our historical celebrations. It is the semi-centennial and quarter-centennial anniversaries of important events that we chiefly delight to honor. In domestic life, in like manner, our golden and silver "weddings," and those of baser metal also, are suggested by the same metric or decimal idea. Why not, then, take advantage of this national metric festival to adopt in our weights and measures the convenient scale with which we are already familiar in our currency and in our chronology?

We had supposed that by this time everybody was pretty well acquainted with the nomenclature of the metric system, but the following paragraph, in an article quoted with implied approval by the *Christian Union* from the *Hartford Courant*, shows that there is still some confusion on the subject in the editorial if not in the popular mind: —

> We are slowly coming to it. We shall be buying our codfish and selling our butter by the gram shortly. Gram is an easy word to speak; better on the whole for constricted Yankee jaws that can't swing open to say pound — round and full. A gram is thirty-two ounces, or thereabouts. Call it two pounds and we shan't be far out of the way. Good pigs will weigh 150 grams by Christmas. In exchanging the ounce for the tenth of a gram — the decigram — we get rid of another peaked word, as Yankees speak it.

The writer evidently confounds the gram with the kilogram, which is a thousandfold greater. The gram is a trifle more than *fifteen grains*, too small a weight for any Yankee to use in buying codfish. The Christmas pig of our Connecticut contemporary would weigh not quite five and one third *ounces* avoirdupois, a homœopathic quantity of pork for the winter supply of a Christian household.

Many people who would not, like our friend, confound the gram and the kilogram, have no definite notions of these metric weights and measures. They have read the names and numbers in the printed tables, but are not familiar with them in a concrete form. The best preparation for the introduction of the new system would be to furnish examples of the measures and weights in a cheap form, and so far as possible in combination with those in ordinary use. In the case of the linear measures this could be readily done; and we believe that the first maker of yard-sticks and foot-rules who shall put the decimal measures on one edge or side of these — which would be an insignificant addition to the labor and cost of manufacture — will find his goods at once in great demand. The measures of capacity and the weights could not well be combined in a similar way, but metric sets of the latter would find a ready sale at prices corresponding to those charged for the common weights; so would litre measures of tin with decilitre divisions marked upon them. At present nothing of the kind is to be got, except of the

makers of scientific instruments and at fancy prices.

And the same may be said of Centigrade thermometers, which ought by this time to be in every-day household use. Why does not some manufacturer put the Centigrade scale on his thermometers beside the Fahrenheit scale, the two on opposite sides of the tube? Only the freezing and boiling points need be marked in words, if indeed even that is necessary. The conventional "temperate," "summer heat," etc., can well be spared. Such instruments are now to be bought, but at three or four times the cost of the common ones, to which the extra scale might be added with no extra expense worth reckoning. The increased demand for his wares will amply remunerate the maker who shall put such thermometers into the market at the same prices he now charges for the common kind.

Let the people be made familiar with the metric system by these cheap practical models, and the day of its general adoption will, we believe, be materially hastened. So mote it be.

LITTLE BILLS.

When our patrons who are in arrears for the Journal open the present number, a little slip of paper will fall out, perhaps upon the floor or upon the table. Please do not allow it to be swept into the fire before it is examined, nor afterwards. It is a little reminder of what is due for the Journal, and if the slip is carefully folded up with the needed *paper* currency (it is not necessary to send *gold*), and returned to the office, it will be sent on its travels directly back again with the autograph of the publishers at the bottom. This is all at present.

VIOLLET-LE-DUC ON ARCHITECTURE.

The "Discourses on Architecture" by Viollet-le-Duc abound in wise and brilliant passages that tempt one to quotation. The following, for instance, on the difference between the Roman ways of building for public and for domestic purposes, is admirable as a bit of analytical description, and equally so for the "moral" it conveys: —

We have seen the Roman, in his public monuments, submitting to the laws of symmetry; here he maintained his dignity; he was a magistrate, he built for the public, and, in doing so, recognized that symmetry was a powerful agent to display his grandeur to the multitude; but at home he laid aside his official character, he built to please himself. In these apartments he courted the sun, in those he studiously avoided it; he availed himself of every advantage of his site; he required comfort, and never allowed himself to be guided by vanity, like that of the modern lord of the manor, whose first wish is that his mansion shall represent a correct architectural composition, even if to attain this end he must sacrifice his domestic ease. The Roman in his country-seat, with a rare sagacity and a delicate taste, yielded everything to the accommodation of his material and intellectual needs. He required provision for the bodily health and comfort of himself and family; and he needed a library, quiet apartments for study, such as would give him facilities for that recuperation essential to every mind which would be kept whole and sound; he must have his gymnasium for the mind as well as for the body. Interior luxury and splendor had their place in his house, but he never sacrificed to these the arrangements necessary to his comfort.

There is a deal of condensed wisdom in the following pointed statement of certain architectural truths and falsities: —

It is true that a very long, wide, and high room should be lighted by larger windows than those appropriate for a chamber; the contrary is false. *It is true* that a portico, composed of a colonnade or arcade, is intended as a shelter from the rain, the sun, and the wind; the relations between the height and width of this portico must be such that those who walk beneath may receive this protection; the contrary is false. *It is true* that a door is made for exit and entrance, and the size of the opening of this door should be regulated by the greater or less number who habitually go in and out thereat; but however dense a crowd may be, it never averages more than six feet in height, or, supposing it is composed of people bearing lances, banners, canopies, and the like, it never attains a height of more than twelve or fifteen feet; to make a door fifteen feet wide by thirty high is therefore absurd. *It is true* that a column is a support, not a decoration, like an arabesque or frieze; if, therefore, you have no work for columns to do, you should not cover your façades with them. *It is true* that the object of a cornice is to protect the walls from rain; to place a heavy projecting cornice in an interior, therefore, is unreasonable. *It is true* that a staircase is necessary to give access to the upper parts of a building; it is not a place of repose, but of passage. If, therefore, it is made more important than the rooms to which it gives access, it may be a magnificent staircase, but it is certainly a very unreasonable one. *It is true* that the thing which bears should be proportioned to the thing borne; but to build a wall or series of piers of stones six or eight feet thick, simply to carry floors which might be sustained quite as well by a wall three feet thick, is to do an inexplicable thing, which satisfies neither my understanding nor my eyes, and is a prodigious waste of precious material. *It is true* that vaults ought to be stayed by buttresses of some kind; but it is a lie to use pilasters, engaged columns, and other buttresses when there is no thrust to be met by them.

The following is an essay on art compressed into a single pithy paragraph: —

The catholicity of the arts is a very essential characteristic of every favorable epoch; that is, their application equally to the cottage, to the palace, to the opulent metropolitan cathedral, and to the humble village church. Thus the modest Greek construction exhales a perfume of art as well as the richest temple, and the little houses of Pompeii, built of rubble or brick, are as much works of art as the public monuments of that city. But an epoch which regards art as a mere matter of luxury, an appurtenance of the privileged classes, or an envelope proper only for certain public monuments, may be a well-administered epoch, but it does not possess the highest element of civilization, and perhaps one of the most essential qualities of public tranquillity. There are intellectual enjoyments as well as material enjoyments, and the former, like the latter, when they become exclusive and privileged, create envy and ill-feeling. If but a few know how to read, the ignorant crowd, when it chances to get the upper hand, burns books with as much passion as it burns sumptuous châteaus, where all the material pleasures of life are brought together. If everybody can read, books will accumulate and remain uninsulted upon the library shelves. In the same manner, to make of art a matter of luxury, or to associate it only with wealth, is dangerous alike for art and for the exclusive few who patronize it. It is important, therefore, to render art catholic, and to restore it to its proper influence over all things and its proper place everywhere; it is important that the minds of all, and of artists more especially, should be penetrated with the truth that art in architecture does not consist in the employment of precious marbles or in the accumulation of ornaments, but in distinction of form, in the most graceful and the most honest way of doing practical things; for it costs no more in money, although it may in thought, to cut stones or to lay bricks according to judicious principles and with a proper regard for æsthetic proprieties, than to cut and lay them without duly considering the place they are to occupy in the building and the part they are to bear in its general effect.

The true philosophy of architecture for our day is succinctly and forcibly set forth in these two extracts: —

It is not enough for the modern architect to admire the works of the past, and merely to copy them is an avowal of impotence; but he must comprehend them and be so penetrated with their spirit as to be able to obtain from them deductions suited to the present time; he must see in form only the expression of an idea. A form which admits of no explanation, or which is a mere caprice, cannot be beautiful, and, in architecture, every form which is not inspired by the structure ought therefore to be rejected. . . .

It is very certain that for us in the nineteenth century, there is only one true method of architectural composition, and that is to submit implicitly to all the requirements of the problem given us, and then, avoiding any attempt to force modern necessities to fit antique forms, so to modify those forms that they shall become the expression and the exponent of the necessities we are called upon to accommodate. A form which is truly such an exponent must of necessity be good and lasting; for all those who have studied architecture for any length of time, without having imbibed too many of the prejudices of the schools, have had occasion to observe that every form which is the unaffected expression of a necessity, even though the necessity is vulgar, has a peculiar charm.

A DANGEROUS PLAYTHING.

BY S. P. SHARPLES, STATE ASSAYER.

Recently, while passing along the street in Boston, our eye was attracted by some brightly colored pieces of paper displayed in a window. Upon examination we found that the paper was cut into figures, such as hearts, diamonds, circles, and shields. Two or three hundred of these pieces were put into an envelope which was labeled "Kindergarten Packet." All this was very well, and showed enterprise in the originator; but we do not suppose that there are many parents in the city who, if asked to take home three or four grains of arsenic for the children to play with, would not hesitate somewhat before doing so. Yet each of these packets contains fully that much, a considerable number of the pieces of paper being colored with the beautiful but dangerous Paris green, or acetoarsenite of copper.

Children will naturally put the pretty pieces of paper into their mouths, and the consequences may be dangerous. Notwithstanding all that has been said and written on this subject, the sale of these deadly papers still remains unrestricted by law, and we daily see them used on railroad and concert tickets, boxes for confectionery, and other articles.

EDITORIAL NOTES.

Hindu Tricks with British Goods. — How the heathen of India manipulate English cloths for market is shown by the following extract from the *Madras Mail:* "An unusual practice is common among the cloth sellers in Jubbulpore. Bales of

English piece goods are carried to the Oomtee rivulet and washed; and the object of this is to thicken the texture of the cloth, and so to get a much higher price than that current for them as they arrive from Manchester. The pieces are one by one opened out at the river's brink, and washed in the running water. This takes off the English sizing; they are next re-rolled and well beaten with wooden clubs, dipped, and beaten again and again, and so on for hours; the threads then begin to swell and thicken the cloth, so that the weaving appears close and tough. They are then re-opened and partly dried, dipped into a tub of well-boiled rice-water (such as is used by dhobies for starching), and carefully hung out to dry. When dried, each piece is carefully refolded, pressed, and placed in the shop for sale. The change the cloths undergo by this process is astonishing. A coarse long cloth, worth say four annas a yard, is transformed to a close-textured fabric rivalling one of Horrocks's best. The cloths so improved are chiefly sent out to villages, where they are readily sold as Manchester goods of the stoutest and best quality."

Nothing New under the Sun. — M. Buchwalder, in a letter to M. Dumas, remarks that the recent invention of M. Mouchot for the industrial application of solar heat was virtually anticipated in the time of Numa Pompilius by priests of the temple of Vesta, for kindling the sacred fire, should this, from any cause, go out. Plutarch describes the arrangement, which was a hollow vase (formed with the sides of a right-angled isosceles triangle), such that, when turned to the sun, all the rays from the sides united in the centre; "There," he says, "they subtilize the air so strongly that they inflame it, and when any arid and dry matter is brought near, the fire seizes it, because the air by means of reflection takes the form of flame and forces it to be inflamed."

The Latest in Coffins. — The London *World* gives the following description of the latest thing in coffins: "You are placed in a glass box, to the top of which is affixed a metal rod. As soon as the earth is filled in, a battery is connected with the rod and an electric shock shatters the coffin into a thousand pieces, thus allowing the earth to press upon the dear departed, and allowing him to return to dust even quicker than in one of Mr. Seymour Haden's wicker baskets."

The Cold Air Attrition Mills' Products. — In reply to the inquiries of correspondents, we would say that the grinding of the wheat and preparing the "pearled wheat" *cold* is an important consideration. The bran portion in the flour is ground as fine as the white, and without any elevation of temperature. This feature in flour-making, we think, is new, and gives peculiar value to the products of this company's mills.

ATOMS.

A cement, impermeable to air and steam, and especially well adapted to use for steam or gas pipes, is made of powdered graphite 6 parts, slaked lime 3 parts, sulphate of lime 8 parts, and boiled oil 7 parts, well kneaded. — The *London Medical Record* says that a society of rat eaters has been formed at Gembloux, in Belgium; the members meet once a week, and the proceedings are wound up by a grand banquet, in which preparations of that delicious animal hold a prominent position. — M. Lostal, a railway contractor, of Ferminy, has communicated to the Society of Mineral Industry at St. Etienne, the results of his observations in preserving wood: he piles the planks in a tank, and puts over all a layer of quicklime, which is gradually slaked with water; the wood is said to acquire remarkable consistency and hardness, and to be quite safe from decay. — "Coals to Newcastle" is no longer a joke, large quantities of coal being now carried thither from the north over the Midland Railway. — An Englishman is said to have invented a process by which chalk is converted into a stone having great hardness and durability. — Among the most recent additions to Yankee manufactures which are finding a market in Great Britain is that of leather belting, the first invoice of which was shipped recently by a New York firm upon the order of Sir William Armstrong, the great gun manufacturer, of England. — The Duke of Westminster is so well satisfied with the results of his experiment of admitting the working classes to the picture galleries at Grosvenor House, that he intends to grant the same privilege next year; between 20,000 and 30,000 persons availed themselves of the opportunity of inspecting the duke's art treasures this year. — The value of the wood required for the construction of the St. Gothard railway is estimated at 8,000,000 francs, or $1,600,000; and a company of merchants is about to be formed to purchase forests to provide this wood. — A solution of shellac in naphtha or alcohol may be used for fixing paper labels on tin. — Diamond cement, for glass or china, is nothing more than isinglass boiled in water to the consistency of cream, with a small portion of rectified spirit added; it must be warmed when used. — *Harper's Magazine* for January contains the second article on the progress in science appearing in the valuable series entitled "The First Century of the Republic;" and among the illustrated articles is an excellent one about "Cambridge on the Charles." — We regret that the publication of the *American Artisan* is to be suspended. — An Indian correspondent, describing the yearly resort of pilgrims to the sacred city of Allahabad, says that in October, when the crowds are enormous, thieves penetrate into the yelling mass, tear out the men's nose-rings and the women's ear-rings, and swallow them; when caught in the act, however, they are placed in the hands of the medical staff, emetics administered, and the ejected ornaments returned to their owners. — No New England teacher should fail to subscribe for the new volume of the *New England Journal of Education*, which will do honor to the Centennial year by special features and increased attractions. — The *Scientific American* will also commemorate the year by publishing the *Scientific American Supplement*, of sixteen quarto pages, weekly ($5.00 a year, or $7.00 for the two journals), intended to illustrate and describe the many interesting themes and objects presented in the Philadelphia Exhibition, with much other valuable and interesting matter. — It is proposed to hold an Electrical Exhibition at Paris, in 1877, in the Palais de l'Industrie, the object being to illustrate all the applications of electricity to the arts, to industry, and to domestic purposes; the project has been received with general favor by the scientific and industrial worlds, and the necessary funds have been already guaranteed. — The December number of the *Journal of the Franklin Institute* is the 600th issue and completes the 100th volume of that sterling technological monthly. — Look at our "Clubbing List" before ordering your periodicals for 1876, if you would make the most of your money in these hard times.

LITERARY NOTES.

The *sixth* revised and enlarged edition of *Dalton's Human Physiology* has been published by Mr. H. C. Lea. It is a manual with which we have been familiar from its first appearance, and we know of no work of similar compass that we should be inclined to rank above it. We see that it still holds its position at the head of the physiological text-books in the Harvard Medical School course of study. In this new issue, every part of the work has been thoroughly revised, and the additions, though carefully condensed, add full fifty per cent. of matter to the book. The new chemical notation and nomenclature are adopted, and also the metric measures and weights. The typography and illustrations are all that could be desired.

A manual of similar scope, but considerably larger, is *Flint's Text-Book of Human Physiology*, for the use of students and practitioners in medicine, just published by the Appletons in a handsome octavo, copiously illustrated. It is an admirable condensation of the author's work on the "Physiology of Man," in five volumes, which is perhaps the most complete and elaborate treatise on the subject in the English language. It differs from the larger work mainly in the omission of historical references and of discussions of minor or controverted points; while it is far superior in its illustrations, many of which are electrotypes from the original engravings in Sappey's great work and unequalled in their mechanical execution. It is in every respect well adapted to the wants of the medical student.

A book which no one interested in the bearings of science upon religion can afford to ignore is Professor Cocker's *Theistic Conception of the World*, recently published by the Harpers. It is written to oppose those tendencies of modern thought the ultimate expression of which is "No soul, no God, no providence, no immortality." To this is opposed the theistic conception that God is the first principle, the unconditioned cause of all existence, that He created the universe and preserves it and rules it by his continuing providence, and that man stands in a somewhat more immediate relation to God than physical nature, and is under moral government. "These propositions the author elaborates, supports, and enforces with vigor of thought, wealth of learning, and enthusiasm of conviction. His method is logical, his style is clear, his spirit is just, and the book is one likely to gain the attention of the leading minds interested in the great debate on either side." We shall be curious to see how the arguments of the book will be met by the "modern thinkers" against whom it is directed.

The *Life of the Rev. John Todd* (Harpers) is the biography of a man of more than ordinary talent, and yet more remarkable for his individuality and force of character. It is told mainly by himself, which adds vastly to its interest. It is rare nowadays to find a biography so readable. As another has said, "It is thoroughly interesting, either as the mere history of a life full of moral heroism, self-sacrifice, great joys, and bitter sorrows, or as the authentic memoirs of a man distinguished among those of his own profession." Among the illustrations of the book is one of the doctor's workshop, in which he found his favorite recreation. He was a genuine Yankee in his mechanical tastes, no less than in more important traits of character. The book is compiled and edited by Rev. J. E. Todd, of New Haven, a son of Dr. Todd.

Farm Legends, by Will Carleton (Harpers) is a collection of poems in the same vein as his "Farm Ballads," issued a year ago, of which nearly 50,000 copies have been sold. This companion volume will doubtless be equally popular, for the simple reason that it is literally *popular* poetry, its themes drawn from every-day life and treated in plain every-day language, yet in a genuine lyrical spirit, like that of the old ballad-singers. There is nothing "sensational" about the poems, and the taste for them is a healthy though it be not a highly cultivated one.

Miss Mulock, who preaches much and not badly in her novels, now comes out with a little book of *Sermons out of Church* (Harpers), which are better than many one hears in church. There are half a dozen of the discourses, and they will all be found eminently "practical."

Of the beautiful juvenile books of the present holiday season, the most beautiful, perhaps, is Miss Johnson's *Catskill Fairies* (Harpers), illustrated by A. Fredericks. The stories are full of fancy and poetry, and of fun withal, and the pictures are charming in design and exquisite in execution. If American art has produced finer specimens of wood engraving, we have not seen them. The book will be a favorite for many a Christmas.

Among the less costly books for the young folks issued this season, we can cordially commend the *Nine Little Goslings*, *Mice at Play*, and *From Six to Sixteen* (this last a story for girls); also *Jolly Good Times*, capital sketches of child-life on a farm. All these are published by Roberts Bros., who have also issued a holiday edition of *The Shepherd Lady*, by Jean Ingelow, a collection of her poems not included in any former volume. The illustrations are by leading English and American artists, and, though of unequal merit, will on the whole compare favorably with those of any other gift-book of the season that costs no more.

A book that will be very "taking" during the holidays, and hardly less in demand the year round, is Whittier's *Songs of Three Centuries*, brought out by Osgood & Co. in two styles, the cheaper of which is sold for two dollars. It is a smaller collection than Emerson's "Parnassus," being limited to a narrower range, but within that range it draws from a larger number of authors, including not a few whom the more fastidious and exclusive taste of Emerson would reject. It will on this account be more popular as a household book of poetry than the "Parnassus." It is also more accurately printed, thanks to the editor, or the proof-reader, or both. The preface is a genial and sympathetic piece of criticism.

The *Blithedale Romance* and the *Twice-Told Tales* have been added to the new edition of Hawthorne (Osgood & Co.) and the little volumes, with their good-sized, clear-cut type, tasteful binding, and attractive *tout ensemble*, are having as great a run as the "Little Classics," issued in the same style.

Lockwood, Brooks, & Co. (who have all the above books) have published Dr. Samuel Kneeland's *The American in Iceland*, an account of its scenery, people, and history, with a description of the millennial celebration of August, 1874. Notes on the Orkney, Shetland, and Faroe Islands, and on the great eruption of 1875, are added. There is also a good map of Iceland, and nineteen illustrations, mostly from photographs taken on the island. It is the best account of this interesting but little known region that has appeared in English.

A unique and beautiful book from the same publishers is *Silhouettes and Songs*, containing twelve designs of the months in silhouette by Helen M. Hinds, a girl of fourteen, with poems by Whittier, Lowell Holmes, and others, mostly written for the work. The demand for it has been so great that it has been difficult for the publishers to supply it, and its popularity will not be limited to the holidays.

The *Harvard University Catalogue* for 1875–76 has been published by Mr. C. W. Sever, of Cambridge. Besides the usual statistical information, it contains the examination papers of the past year and much other interesting and useful matter.

Wrinkles and Recipes, compiled from the "Scientific American," is an illustrated hand-book of practical hints and suggestions for mechanics, engineers, farmers, housekeepers, and others, issued in very neat form by Mr. H. N. Munn, 37 Park Row, New York city, who mails it, postpaid, for $1.50.

Dean's Interest and Equation Exponents, published by L. L. & M. King, St. Louis, is a labor-saving manual that will commend itself to merchants and accountants. It has novel features that distinguish it from the ordinary "Interest Tables," etc., and for the varied practical purposes of the counting-room it has no superior or equal. A circular setting forth its merits more fully may be obtained on application to the publishers.

Professor E. S. Morse, the well-known naturalist, deserves well of this generation for placing in the hands of students so valuable and interesting a work as his *First Book of Zoölogy*, published by the Appletons. We do not know how anything could be better adapted to excite a love of nature among the youth of our country than this book. It is written in pleasing style, and profusely illustrated from original drawings. The insects are shown in all their parts, some impaled upon pins, and others dissected so as to show internal structures. Every parent should purchase a copy of the book, and allow it to rest upon the centre-table for frequent reference.

With the new year, *The American Naturalist* is to be published by H. O. Houghton & Co, under the editorship of Dr. A. S. Packard, Jr., as heretofore, but with new and attractive features. The amount of matter given in each number will be increased. The typographical dress and illustrations, which have heretofore given character to this magazine, will be improved, and it will be of a more popular nature than before, so as to interest the general reader as well as the young naturalist. It will continue to be a journal of science-education and for the use of science-teachers. The price will not be increased, and we shall continue to furnish it *with the* JOURNAL for $4.25 a year.

Messrs. Lindsay and Blakiston, of Philadelphia, send us sample pages of an English serial work on *Medicinal Plants*, of which they are the American publishers. It is edited by Professor R. Bentley of King's College, and Henry Trimer, of the British Museum, and will give illustrated descriptions of the principal plants employed in medicine, forming a botanical guide to the British and United States Pharmacopœias. It will be issued in monthly parts, each containing eight colored plates, with descriptive text. Messrs. L. & B. will send a sample part, postpaid, on receipt of $2.00, the regular price.

Medicine and Pharmacy.

ANIMAL FOOD IN CONSUMPTION.

BY EPHRAIM CUTTER, M. D.

THE effect of animal food in consumption, *phthisis pulmonalis*, is very remarkable and favorable. Under its use the cough will generally become less, the expectoration diminish, the night-sweat cease, even if there are physical signs of diseased condition throughout one lung. When we understand that nitrogenous food is directly applied to the growth and renovation of the structures of the body, and that consumption, as its name signifies, implies a wasting of tissues and a destruction of the same, it is easily seen how appropriately animal food is adapted to the wants of the consumptive.

The intimate nature of this disease is not thoroughly understood or settled, even after so many years of investigation by thousands of studious physicians. Some attribute it (outside of hereditary predisposition) to defective alimentation, digestion, and nutrition, or in other words to the want of proper food, attended by any influence that depresses the vital powers. Recent experiments in Greece, France, and Germany have demonstrated that it is communicable, that is to say, contagious by contact. In this country a physician whose name I am not permitted to use states that he has the records of one hundred post-mortem examinations of pigs dying of consumption, induced by his feeding them upon sour swill. The writer inoculated six rabbits with tuberculous matter about two years ago; none of the animals perished from consumption, although one had a curious tumor at the site of the inoculation, which continued for six months. It is probable that the perfect condition of the digestive organs resisted the disease. Now, without looking further into the causes of consumption than to say that as a disease of debility and defective nutrition it would be liable to occur among those who eat starch with a diminished amount of mineral food, we would like to relate briefly some few cases that have come under our own observation, premising that they have also occurred in the experience of other physicians, and are selected from a larger number.

CASE I. A man aged twenty-one, seen in August, 1874, presented the physical signs of advanced tuberculous disease in both lungs: diminished resonance on percussion, coarse and fine expiratory râles, increased vocal resonance, no tubular respiration. He had night-sweats, a loss of appetite, flesh, and strength, continuous harassing cough with copious expectoration, pallid look, with every expectation of going down to an early grave. Upon being put on an exclusive animal diet (broiled beefsteak mainly), with a simple medicinal auxiliary treatment, his symptoms became ameliorated, and after an interval of about six months he considers himself almost entirely well. He has gained flesh and strength, the night-sweats ceased long ago, the physical signs had (at the last time I saw him) almost entirely disappeared. In fact, he is so well that he has gone to work at daily labor in a shoe-shop. This young man had been living before his sickness almost exclusively upon flour bread. The animal food was very repulsive to him, and it was only by much urging and coaxing that he was persuaded to continue in its use. Now, however, he is very much attached to the diet, and would not give it up. Should he do so the disease would start into new progress.[1]

CASE II. A man aged about sixty-five, a very active currier, was seen in August, 1873. He was in great alarm about a recent hæmorrhage from the lungs; there was cough, paleness, loss of flesh and strength; the heart's sounds were abnormal, there was dulness on percussion, and expiratory crackling over the left upper third front, night-sweats, and loss of appetite. Moping spiritlessly about, he acted, if he did not speak, his sentiments of the grave character of this disease. Animal food exclusively, with change of air, local medication with tonics, in the course of the year wrought such a change in him that he resumed his business and has continued in it up to the present time, although he has exposed himself rather unwisely. Now it seems as if the full supply of nitrogenous food acted in combination with other means to restore the tissues to their normal power of resisting disease. The physical signs of diseased lungs had disappeared on the last examination; the cardiac trouble remained. At the present time he continues well.

CASE III. A man about fifty, in February, 1874, had ague, cough, wasting, night-sweats, loss of appetite and strength, copious expectoration, diminished resonance, and expiratory crackling over the left upper third front. He was alarmed and feeble. Though it was distasteful, he pursued the animal diet, taking it as a medicine, and also took some alterative drug. The improvement in this case was marked and prompt; the physical signs, cough and expectoration, diminished and disappeared, and now he seems restored to a perfect state of health. It is proper to state that there might have been an error of diagnosis on my part; still, the case was one which if not already tuberculous was in a fair way to become one.

CASE IV. A woman aged about fifty was seen in July, 1872. She had lost a daughter the season before by consumption, and now she was attacked with the symptoms of the same disease. (Was it communicated by contagion?) The emaciation, the cough, the expectoration, the physical signs of dulness in the left lung, and crackling expiratory murmur, were well marked. Under the animal food and appropriate treatment she regained her health, and is living to-day in the enjoyment of it.

CASE V. A woman thirty-four years of age (father and mother both died of consumption), with decided marks and physical signs of developed disease in both lungs, was placed upon animal food diet and tonic medicines outside and in. Although the restriction of the diet was very irksome and repugnant to her, still with rare fortitude and firmness she adhered strictly to the path marked out, and has been rewarded by a return to comparatively good health (she calls herself well). The physical signs have almost entirely disappeared.

CASE VI. A young lady ten years ago (1865) had cough, loss of appetite, emaciation, narrow chest, dulness on percussion, and expiratory crackling at upper part of one lung. Animal food with tonics resolutely enforced cured her, and she is now living and well.

It is very interesting to see the effects of animal food in a complaint so universally fatal and unhappily so very prevalent. Cases might be adduced from other physicians' practice beside my own, tending to the same result. They show the great importance of diet in chronic complaints, and prove that in tissue-wasting diseases a perfect pabulum should be afforded as a basis for proper treatment. If this is done in the green tree, what may not be done in the dry?

It would be very desirable if some hospital or sanitarium for the treatment of consumption could be established to test the effect of food upon a large scale. The cottage form of hospital would be the only desirable one, as in view of the present doctrine of the contagiousness of tubercle one would shrink from crowding consumptives together in large wards. The morale of an organized hospital is more favorable to carrying out a regimen than the loose government of private families. The very idea of going to some specific place for a particular purpose gives a psychological element of firmness and decision of character not otherwise to be attained. There is here a fine opportunity for some one to devote his posthumous wealth to doing a real good to mankind, that is, founding a hospital for this purpose and settling the question beyond doubt.

[1] The above is the first six months' record. Subsequently he drank bovine blood, but with no advantage, as he lost ground. In August, 1875, he was comfortable, but disease was marked in upper third front.

THE MODEL SICK-ROOM.

THE following is an extract from Professor A. B. Crosby's excellent lecture on "Common Sense in the Sick-Room:"—

The room which is selected for a sick-room should be as far removed as possible from those ordinarily occupied by the family, in order that the patient may have the benefit of perfect quiet. It should be large, airy, well lighted, and, if possible, should have a sunny exposure.

The *wall* of the sick-room is a pretty important matter to the patient. If it is covered with one of those dreadfully variegated papers, which, alas! are regarded as ornamental, it will be found, especially if the patient is suffering from any disease in which

there is abnormal exaltation of the brain, that it is a source of great annoyance, and may even be positively injurious. For, as his eyes run over those pictures, he will fancy that he sees images of various kinds, such as angels and demons alternating; indeed, these figures will assume every conceivable form, and he becomes thoroughly worried in the attempt to disentangle the confusion.

The paper covering the wall should have a uniform, neutral tint, such as a light green, a delicate buff, or a very delicate slate color; a light green, perhaps, is as agreeable to the eyes as any color that can be selected, and it rests the eyes with a refreshing monotony. Such a uniform tint tends to "healthy stupidity," and this leads to repose.

The model sick-room should never be carpeted, but ordinarily should have a hard-wood floor, and this should be oiled and varnished. Upon such a floor may be spread as many pieces of carpeting, rugs, and mats as are desirable. These may be placed in front of the bed, over the parts which the nurse traverses while performing his or her duties, at the doors, etc. Each morning these can be quietly slid along the floor, taken out, and thoroughly shaken and aired. After they are removed, the floor can be wiped off with a damp cloth or soft brush, and when it is dry, the rugs, etc., may be replaced. If the floor is managed in this manner, what was known among the older writers as the *materies morbi* certainly is not likely to accumulate, and that is an essential item of consideration in the management of the sick-room.

The *windows* should be so arranged as to admit abundance of light. Light is a normal stimulus to the human body, and we have no good health without it; you cannot grow healthy cabbages in a dark cellar, nor can you any more easily cure invalids without the influence of sunlight. There are some acute diseases, during the progress of which it may be necessary to temper the light, but it should never be entirely shut out, for if it is you remove from the body one of its important natural stimuli.

The windows never should be surrounded by tapestry or decorations of any kind that are made of woolen stuff. A plain white shade is all that is requisite to temper the light and cut off outside objects from the patient's view, and the window-frame should be free from lambrequins, hangings, etc., which may become impregnated with the germs of disease.

THE TREATMENT OF TRUE MEMBRANOUS CROUP.

Dr. W. H. Vail writes to the *New York Medical Journal* as follows: —

My experience during the last spring, with four very severe cases of unmistakable membranous croup, has led me to consider it a disease as amenable to treatment as dysentery or remittent fever. The symptoms in all the cases being so similar, and coinciding so exactly with those attributed in Dr. Flint's practice to laryngitis with exudation of lymph, I will not detain you with the recital of them, only referring to them as occasion may require in connection with the treatment. Upon seeing a patient suffering from this disease, I immediately give him a full dose of calomel, from fifteen to thirty grains, to be repeated in six hours if the bowels have not operated. It allays the fever and acts kindly on all the secretions. When this effect is desired in any disease, large doses must be given, according to Dr. Lente's plan. All of the popular hue and cry against this valuable medicine, and all of our bad results and disappointments from its use, have come from our giving it in too minute doses. It matters very little how much you give, if you only give enough to operate on the bowels, or follow it with something which will assist it to operate. At the same time I order the patient to be kept day and night in the kitchen, or a room which can as readily be kept heated at a temperature of 90° F., and the air loaded with moisture till it runs down the windows, as we see it on washing-days. To make this measure effective, Dr. Sayre's plan must be followed of keeping the temperature at 90° or 95°, if necessary, as I found it in one case. You will be surprised and gratified in a few hours at finding your patient breathing easily and sleeping quietly, to whom, before, each breath was a struggle, and there was no such thing as sleep. You must impress upon the friends the importance of maintaining the heat and moisture. If the thermometer falls to 80° or 75°, the old trouble will return. In one case I kept the heat at 90° for three days and two nights, before it seemed safe to let it subside.

These two remedies (calomel, and heat and moisture) seem to stop at once the further formation of the membrane, and to loosen what is already formed, or cause it to be absorbed. They acted like a charm with three of my little patients; the fourth was moribund when I first saw him, and died in less than twenty-four hours, asphyxiated. No attempt at tracheotomy was made in his case, as the membrane evidently extended to the bronchioles, and no operation could relieve him.

To cure any sore throat that may exist, I dissolve half a drachm of chlorate of potash in a glass of water, and give a teaspoonful every two hours. I give it in all cases, for it is a tonic, and acts well on the membrane, wherever it may be.

To maintain the strength I rely on quinine, and I find the following simple prescription the most palatable and acceptable to the stomach: —

Cincho quiniæ	3ss.
Syr. simplicis	3ij. M.

Pulverize and triturate thoroughly. From a half to one teaspoonful every four hours.

Of course milk, eggs, milk-punch, beef-tea, lemonade, flaxseed tea, etc., enter as nourishment into the treatment, to be varied as the strength and taste of the little ones may require.

BABIES.

We do not know whether the following is original with the London *Sanitary Record*, in which we find it, but we feel that we are doing a service to the babies in reprinting it: —

These noisy parents of the race to be would, if they could, frequently tell stories of a great amount of needless suffering which is entailed upon them by the thoughtlessness of their "good-natured friends." When they first wake up, it is no uncommon thing to have a candle flared before their eyes, to amuse them with the "pretty red light;" then, perhaps they are jumped, screamed or whistled at, tossed up in the air so violently that their nerves are thoroughly shaken. At other times the infants are poked in the ribs, unclean fingers are thrust into their mouths, whether the poor things like it or not, or they may be tickled into spasms, or "bo-peeped" at so vigorously as to thoroughly scare them, if it does not induce St. Vitus's dance. Should the poor, helpless victim scream, which is the only protest it can make, it is libelled by being called fractious, and perhaps dosed with soothing-syrup.

Other kind friends of the baby will, in the most thoughtless manner, kiss and hug the poor little victim, even when suffering themselves from sore throat or colds, and so entail an unknown amount of evil on the child, simply from want of the commonest thoughtfulness.

If some of these boisterous nurses and friends would remember that a very little violent excitement goes a long way with infants, they would save them much needless suffering both in the present and in the future; rest and quietness are the chief things they require, and yet seldom get; especially in a large family, or where there are many friends who take their turn to tickle and amuse the victim into a sort of hysterical spasm, and then think him or her happy. Again, in playing music to them, the most noisy and startling tunes are generally selected, to the acute torture of the sensitive tympanum, instead of those airs which are most soothing and gentle.

These are a few of many needless sufferings to which children are thoughtlessly exposed. Another very common source of torture is carelessness in wheeling the perambulator. In street crossing, these vehicles are more often than not allowed to bump down the full height of the curb-stone, and then driven full tilt against the opposite curb. Such shocks try severely the spine and nerves of the tender infants who are unfortunately consigned to the mercies of a careless nurse. We once heard of a baby who was reported to have said, "How stupid parents are!" and if that infant prodigy should live to be a hundred, it would never say a truer thing of the majority of fathers, mothers, and relatives in general.

MEDICAL MEMORANDA.

Early Reference to Jaborandi. — A curious reference to jaborandi has been discovered by the *British Medical Journal* in the works of the Hon. Robert Boyle, published in London in 1772. In the third volume, page 155, of those works the following passage is quoted from Dr. Piso's "Travels in South America:" —

"I saw divers, as it were in an instant, redeemed from death, who had been poisoned by the eating of venomous mushrooms and other unwholesome things only by drinking a recent infusion of the root of *jaborand*, whilst myself and others of Galen's disciples blushed to see the ineffectual endeavors of all our alexipharmacy, treacles, and other antidotes; so that I afterwards suffered myself to be joined in consultation with these barbarous colleagues, not so much to be arbiters of the condition of our men by their pulse, as to gain their assistance and counsel in the above mentioned way, namely, the prescribing of proper medicines."

An English Pauper's "Extras" in Sickness. — We should imagine that the inmates of English workhouses would congratulate themselves when they are sick, if the following, from the *London Medical Times and Gazette*, gives a fair idea of their average treatment in that case: "According to the return of the Visiting Committee of the St. Pancras Workhouse, it would appear that those who are on the sick-list in the above institution are able to command a greater variety and more liberal supply of delicacies than fall to the lot of most persons when suffering from disease. The following is described as the allowance of one of the patients of the above institution, under the head of 'medical extras,' for one week, namely, Bread, 5¼ lbs.; eels, 3½ lbs.; meat, 3½ lbs.; 14 eggs; tea, 14 pints; rice pudding, 3½ lbs.; butter, 8 ounces; milk, 7 pints; porter, 3½ pints; arrowroot, 14 ounces; sugar, 14 ounces; whiskey, 42 ounces; and 14 lemons. By way of variation, soles and poultry were sometimes substituted for eels. This is said to be a fair sample of the allowance to those on the sick-list of the workhouse medical officer."

The Action of Saliva. — The *Doctor* reports that M. Petit recently communicated to the Société de Pharmacie of Paris the results of his experiments on saliva. He had found that 1 gram of ptyaline had the power of dissolving from 10,000 to 20,000 grams of starch, producing a quantity of sugar varying between 3500 and 7000 grams.

Preservation of Infusions. — A correspondent of the London *Chemist and Druggist* says: "I was shown a year ago some watery infusions which by a very simple plan had been kept unchanged for

several years. I immediately adopted it. By merely putting a strained infusion into common four, six, or eight ounce bottles, and allowing these to reach a boiling temperature in a water-bath, and plugging the necks with a bit of cotton-wool, not over-tight, I have always a perfectly good infusion to use. Those of gentian, orange-peel, and rose I have kept in this way for months. If I wish to avoid the second heating, I put the ingredients into hot water in a bottle with a rather wide neck, and placing this in a water-bath bring it to a boiling temperature as quickly as possible, take it out, and plug the neck with cotton-wool as before. The only precaution besides those I have mentioned is to avoid allowing the plug of cotton-wool to become wetted with the infusion."

Lime in the Eye. — A correspondent of the *Druggists' Circular* notes a method of treatment for this accident, the knowledge of which it is quite possible may be useful to other pharmaceutists. He says: "A negro came to me in intense agony, some unslaked lime having got into his eye. That the lime must be neutralized at all hazards, I felt certain. I chose sulphuric acid. I put one drachm and a half of the diluted acid in a four-ounce graduate, filled it with water, and told him to wash his eye with the liquid. He did as he was told, and was relieved almost immediately. Then I made him rinse his eye with pure water, and after that I told him to anoint it with olive oil, and to continue the application for some time. To-day he is almost well, and can see with his eye again. In another similar case, no remedy was immediately applied, as a doctor had to be sent for from some little distance, and the negro lost his eye entirely."

Carbolic Acid as an Anthelmintic. — A Vienna medical journal states that in a case of tænia this acid was given at first in doses of six grains four times a day; but this proving ineffectual, two grains were ordered every hour, with the result of expelling the worm, head and body, on the third day.

FACETIÆ.

A "Heathen Chinee" Medical Diploma. — The *Australian Medical Journal* gives the translation of a native diploma presented before the Medical Board of Melbourne last June, by a Chinese practitioner who desired to be registered in accordance with the legal requirements of the colony. It ran thus: "At a meeting of the college. We, the doctors of this district (Chung Loo), hereby certify that we know you, Quong Hung San San Neng Yong Ah Kan Oo, No. 42, Yee Quock Ping, and we hereby testify that we have correctly examined you, and find that you have studied for six years, and understand the seven external and eight internal pulses, together with the liver, heart, lungs, kidney, and stomach, and bladder, spleen, pericardium, big and small bowels and their pulses; that you are thoroughly conversant with all the pulses in all parts of the body, and that you have studied medicine for four years. We hereby certify that, having passed your examination satisfactorily, you are entitled to practice as a doctor in every district; and we hereby bear witness to your general and thorough knowledge of medicine and the pulses." The signatures and date followed. The board refused Mr. Ping's application, though their reasons are not stated in the journal which records the story. We can hardly think they knew anything to the detriment of Chung Loo College, and we imagine the true ground of their somewhat tyrannical exercise of power must have been the trouble which would be incurred in registering and corresponding with a gentleman so abundantly supplied with Christian names. Mr. Ping, however, through counsel, applied to the Supreme Court for a *mandamus* a few weeks later. The case was fully argued, but again Britannia's offspring triumphed. The Chinese residents in the city, however, were not then satisfied, and it was reported that a subscription was being promoted among them to defray the cost of an appeal to the Privy Council.

Professional Pleasantries. — A correspondent of the *British Medical Journal* rescues from an old volume published more than fifty years ago the following smart interchange of compliments between two members of the medical profession. At the time that Dr. Cheyne and Dr. Winter were the two principal physicians at Bath, they adopted very opposite modes of practice; but the former gave some credence to his prescription of milk-diet by making it the principal article of his own sustenance. Thereupon Winter wrote him these verses: —

Tell me from whom, fat-headed Scot,
Thou didst thy system learn;
From Hippocrates thou hast it not,
Nor Celsus, nor Pitcairn.
Suppose we own that milk is good,
And say the same of grass —
The one for babes and calves is food,
The other for an ass.
Doctor, one new prescription try
(A friend's advice forgive):
Eat grass, reduce thyself, and die;
Thy patients then may live.

Dr. Cheyne's answer was as follows: —

My system, doctor, 's all my own,
No teacher I pretend;
My blunders hurt myself alone,
But yours your dearest friend.
Were you to milk and straw confined,
Thrice happy might you be;
Perhaps you might regain your mind,
And from your wit get free.
I can't your kind prescription try,
But heartily forgive:
'T is natural you should bid me die
That you yourself may live.

SELECT FORMULÆ.

Lotions for Freckles. — The following are both good and harmless cosmetics: —

(1.)	Borax	3 grs.
	Rose water	5 dr.
	Orange-flower water	5 dr.
(2.)	Orange-flower water	1 pint.
	Glycerine	1 oz.
	Borax	1 dr.

Treatment of Wounds. — Dr. A. C. Mackenzie, in the *American Journal of the Medical Sciences*, states that he treats wounds with much success with warm water and a balsamic compound. The warm water not only hastens the exit of disintegrated material, but conveys to the sufferer that soothing effect which heat alone communicates. The formula used is the following: —

Balsam fir,	
True Venice turpentine,	
Oil of sweet almond,	āā 3 ij.

Add carbolic acid ℥ss., previously dissolved in 3 ij. warm glycerine. M.

Apply with a flat camel's-hair brush, and inject into the interstices of the wound with glass syringe, having previously cleansed the wound with very warm water and bulb syringe.

Warm water is applied *ad libitum*, and the diseased or injured portion is enveloped in flannel cloths, which have been immersed in water as hot as can be borne comfortably.

A General Antidote for Poisons. — M. Jeannel gives the following formula for an antidote for a number of deadly poisons: Solution of sulphate of iron (D. 145), 100 parts; water, 800; calcined magnesia, 80; washed animal charcoal, 40. These ingredients are kept separate, the solution of sulphate of iron in one vessel, the magnesia and charcoal in another, with some water. When needed, the sulphate solution is poured into the last-mentioned receptacle, and violently agitated. The mixture should be administered promptly, in doses of from 1.6 to 3.3 ounces. From experiments, M. Jeannel finds that this antidote, employed in proper proportions, renders preparations of arsenic, zinc, and digitaline completely insoluble.

Syrup of Salicylic Acid. — In giving this acid the annexed formula has been suggested: —

Salicylic acid	3 ss.
Oil of sweet almonds	3 x.
Gum arabic	3 x.
Syrup of almonds	3 xij.
Orange-flower water	3 xij.

CINCHO-QUININE.

The following are a few of the most recent voluntary testimonials to the value of this agent: —

Hancock, Houghton Co., Mich., *November* 25, 1875.

Inclosed please find one dollar to renew my subscription to the Journal of Chemistry. I want to say a word in regard to Cincho-Quinine. I have been engaged in the practice of medicine nearly thirty years, part of the time in malarial districts where it was necessary to make use of the sulphate of quinine very freely. During the last four or five years I have used Cincho-Quinine, and latterly to the entire exclusion of the sulphate, except perhaps in certain combinations with iron, strychnine, etc., and I find it in all respects equal, and in many superior, to the sulphate. It does not cause that unpleasant cerebral fulness and pressure, or very disagreeable ringing in the ears, which is almost certain to accompany and follow the use of the sulphate. It is more pleasant to take, especially for children, and it can be safely administered to the youngest infants, as I have given it to babes from three to six months old with no unfavorable effects. It is not so likely to cause nausea and vomiting as the sulphate, and I have never seen it stated that it produced any unpleasant effect upon the sight, nor have I had this symptom complained of by any of my patients. W. W. Perry, M. D.

Plymouth, Ind., *November* 27, 1875.

I have used the Cincho-Quinine for six years, and am well pleased with it in the treatment of malarial diseases; and as a tonic it is equal, and in many cases superior, to the sulphate.

W. Jacoby, M. D.

Grand Rapids, Mich., *December* 2, 1875.

I have used your Cincho-Quinine with perfect satisfaction since 1869, and can cheerfully recommend it to the profession. J. B. Griswold, M. D.

West Union, Mo., *December* 10, 1875.

The Cincho-Quinine came to hand, and I have given it several trials in chills and fevers with good success. J. Anderson, M. D.

Pine View, Fauquier Co., Va., *December* 14, 1875.

Please send one ounce of your Cincho-Quinine to Miss Mary J. Skinker, Brownville, Fauquier Co., Va. She is a patient who, since her first experience (through my directions) with the Cincho-Quinine as an antiperiodic, will use no other. With each new experience with it, my faith increases. In the language of a patron, four of whose family were immediately cured by it of intermittent fever, "it exactly hits the nail on the head."

Henry M. Clarkson, M. D.

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The artificial eyes made by L. Mueller, advertised in this journal by Dr. Th. Roth, are remarkable for their perfect imitation of nature. They are said to be free from lead and irritant materials, and the best offered to the profession.

Premature Loss of the Hair, which is so common nowadays, may be entirely prevented by the use of Burnett's Cocoaine. It has been used in thousands of cases where the hair was coming out in handfuls, and has never failed to arrest its decay and to promote a healthy and vigorous growth. It is at the same time unrivalled as a dressing for the hair. A single application will render it soft and glossy for several days.

Boston Journal of Chemistry.

VOLUME X. BOSTON, FEBRUARY, 1876. NUMBER 8.

Familiar Science.

[Communicated to the Boston Journal of Chemistry]

COMETS.

BY PROFESSOR C. A. YOUNG.

COMETS, as their name implies, are "hairy stars," — masses of luminous cloud, — which from time to time appear and move around the sun in orbits of so great eccentricity that ordinarily they never return. They do not in any proper sense belong to the solar system, are not members of the planetary household, but only celestial "tramps," wandering through the sidereal regions and now and then entering the domains of law and order. Some few indeed have been apprehended, probably by the powerful grasp of the major planets, and now as captives acknowledge allegiance to the sun.

For the most part their orbits are sensibly parabolic, just as they should be if the comets are really bodies falling towards the sun from the remotest regions of space. Of the 250 orbits already computed, about 200 belong to this class, about 40 are ellipses with periods varying from 3½ to several hundred years, and about half a dozen are distinctly hyperbolic. The elliptical orbits are accounted for on the hypothesis that the velocity of the comet in its parabola has been at some time retarded by planetary attraction, while an increase of velocity from the same cause explains the hyperbolic.

Their total number is very great. We have on our lists some 600 since the Christian era, and nearly half of these since the invention of the telescope. But we can see only such comets as happen to approach the sun under favorable conditions, so that the half-dozen or so a year which we observe from the earth are but a small portion of the whole Generally they are so faint as to be visible only with powerful telescopes; but about once in five years, on the average, we have one that can be seen with the naked eye, and sometimes they assume such brilliance and magnitude as excite the wonder and admiration of all. They have been seen at midday, and their trains have been known to extend over more than a quadrant of the heavens. In olden times such apparitions were regarded as the worst of omens, and filled the world with abject terror.

A brilliant comet generally develops somewhat in this way: when first seen it is a faint, rounded mass of haze; it approaches rapidly, *growing smaller* as it draws near the sun (from some cause not yet fully understood), and soon a bright, star-like nucleus appears in the centre, while the comet assumes an oval form; by and by that extremity of the ellipse which is turned away from the sun breaks open, and a faint train of light is formed; often also, at this stage, streams of light are thrown out towards the sun. As the comet comes more fully under the solar influence, the activity greatly increases; the tail grows millions of miles in a single day; puffs of luminosity ascend from the nucleus sunwards, and then seem to drift backward into the train, which at this time is generally strongly curved, widening out gradually from the head of the comet, and brighter at the edges, especially the convex one, than in the centre; often also long straight streamers are thrown out from the convex side of the tail. These phenomena reach their maximum soon after the comet passes its perihelion, or point of nearest approach to the sun; and then the comet, as it recedes with unaverted face (for it never turns its train towards the sun), gradually loses its splendors and at last disappears as it came, a hazy, formless cloud. Compared with a planet, it is a merest nothing, containing so little matter to the cubic mile that even the largest and the nearest have never been known to disturb a planet's motion by a single second, while they themselves have been "sent kiting" by planetary attractions, if one may use such an expression of a celestial body — their orbits completely changed — as was the case with Lexell's comet of 1770. Minute stars, too, have been seen without sensible diminution of lustre through comets having a diameter of more than thirty thousand miles; stars which would have been utterly obliterated by a single mile of summer haze. Still it must be remembered that the total mass of bodies so enormous, even though very rare, must be, when expressed in tons, by no means insignificant. Our own atmosphere, a little shell only 8000 miles in diameter and some 50 miles thick, weighs more than five thousand millions of millions of tons (5000,000,000,000,000), and quite possibly some comets may weigh as much.

As to their constitution, and the causes which produce their peculiar phenomena, very little is yet known. It is certain that they shine, partly at least, by a light of their own, a luminosity in some way excited by the solar action, since they fade out as they recede. That a large portion of their light is not mere reflected sunshine is shown by their spectrum, which exhibits certain bands that in position and appearance closely resemble those obtained by an electric spark in some hydrocarbon gas. Hence it has been concluded (perhaps a little too hastily and positively) that carbon vapor is a constituent of the cometary mass. But some fluorescent solids give similar spectra; and some comets — one at least — give a different spectrum.

That the tail is formed in some way by the sun's action seems also hardly doubtful; and that the force which operates is a repulsive one. But what this force can be, whether a mere result of the solar heat or dependent upon some action more akin to what we know as electric or magnetic, cannot yet be asserted. Indeed, some things almost justify the view that the tail is a sort of luminous shadow, and not really a part of the comet itself. Only a longer and more thorough study of facts can decide the many perplexing questions.

One thing, however, has been made certain by the researches of the past few years: that comets and *meteors* are closely allied. The flock of meteors through which the earth occasionally passes in November has been found to move in a cometary orbit, and in 1867 Schiaparelli showed that Tempel's comet of 1866 preceded it in the same path by not quite ten months. Then again it is found that the August meteors move in the same track as the comet of 1862. Finally, on November 27, 1872, the earth in passing the place where the orbit of Biela's comet (which split into two parts in 1846 and has been lost since 1858) crosses hers, encountered a flock of little meteors which fell by thousands for several hours. Some, therefore, identifying these meteors with the aerolites which sometimes fall, and supposing them to differ from the aerolites only by being exceedingly minute, conclude with some probability, though by no means certainly, that a comet is nothing but a flock of such particles, a cloud of celestial dust.

CURIOSITIES OF CLIMATE.

THE occurrence of "cold waves," like the one that swept over New England at the beginning of December, is not peculiar to our corner of the world, but is occasionally known in more favored climes. Even Italy, which is always "sunny Italy" in poetry and romance, is not exempt from these frigid visitations. At the very time when we were shivering under the sudden depression of temperature to which we have just referred, the dwellers in Naples and its neighborhood were bewailing a similar dispensation of unseasonably cold weather. The following is part of a letter from a resident there which appears in the London *Times* of December 6th: —

"A more wintry scene than that which lies before us you could scarcely have in England. As far as the eye can see, the several ranges of mountains are covered with snow, while here in the foreground, audible as well as visible, rises up Vesuvius, as white as a sugar-loaf. Here in the low grounds, however, snow does not fall, but something quite as cold and trying, for rain and hail are continued, and have scarcely ceased for the last fifteen days. The prospect before us is far from encouraging, according to a proverb much trusted in by the people, who say that when it rains on December 2d it will continue for upwards of forty days The damage which has been inflicted on the country, from north to south, by the deluge which has poured down upon it, is most serious. Every railroad in the kingdom has been more or less injured, and if communication has not been entirely impeded, it has been 'limited,' as the journals have officially announced almost every day. Fewer trains have left, and at certain points where bridges have fallen, or portions of the road have been washed away, passengers and goods have been transferred across the gap from one train to another. Farther north, from Rome to Florence

by Leghorn, and on the whole of the Maremma line, the state of things is as bad, or even worse. I am writing by lamp-light at half past eight o'clock; there has been thunder and lightning all night, and the storm is still pealing and flashing awfully; while the ground, as if in correction of the statement at the commencement of this article, is white with mingled snow and hail. Of course all agricultural pursuits are suspended. Where the grain has been sown, it has been all washed out. No foreigners are coming in, and the prospect for those in the country and the town who depend on the season is as bad as it can be."

In Arctic regions, according to the testimony of all the exploring expeditions, there are often sudden and extraordinary changes of temperature, the mercury going down many degrees in a few hours — or the alcohol, rather, for the decline is not unfrequently below the freezing point of mercury. Lieutenant Payer, one of the leaders of the recent Austrian expedition, in a paper read before the Geographical Society of Vienna, gives some striking illustrations of the influence of Arctic cold. He started, March 14, 1874, on a sledge, to make fresh observations on hitherto untrodden ice-fields. The cold on that day was 42° Réaumur, or about 67° Fahrenheit, below zero. After a time the spirit ration became as thick as oil, and had lost its stimulating properties. It was impossible to smoke; cigars and tobacco were turned into ice. Pieces of metal had the same effect when touched as red-hot iron. Great cerebral disturbance took place, accompanied with extreme thirst, difficult to assuage. Every noise was transmitted a great distance. The senses of taste and smell were almost in abeyance. Mercury could be made into balls. The secretions were augmented, while perspiration entirely ceased.

A description like this makes our "zero weather" seem quite mild and endurable; while to the Italian, who rarely sees the mercury fall to the freezing point, a genuine New England "cold wave" would doubtless seem as terrible as one from the North Pole does to us.

CHEMICAL EXPERIMENTS WITH THE MAGIC LANTERN.

Of late years the magic lantern has been much used by lecturers to illustrate the curious and beautiful reactions of chemistry. We wonder that it is not regularly employed for this purpose in our high schools and academies. There are many interesting experiments that may be performed with such apparatus as the teacher in these schools generally has at hand or can make for himself with slight labor and expense.

The chief thing needed for the purpose is a transparent tank to be used as the "slide" in the lantern. This is readily made by securing two plates of glass, about four by five inches in dimension, against a strip of india-rubber half an inch thick, bent to form three sides of a rectangle. It may be notched at the corners to facilitate the bending. A few small pipettes, with solutions of some of the most common chemicals used in a school course, are the only other things required in addition to the lantern.

The tank, three fourths filled with water, being placed as an object in the lantern, a great variety of chemical reactions can be shown. The following experiments, condensed from English sources, will serve as examples, and the teacher will have no difficulty in adding indefinitely to the number: —

1. Pour in a little solution of sulphate of copper, and mix it well with the water of the tank; then with the pipette run in, with more or less force, some diluted ammonia, pausing from time to time to observe the progress of the effect. On the screen will be observed the gathering of a tempest of black storm-clouds, which twirl around in violent commotion, as if urged by a tornado of wind, but as the action continues, these clouds will melt away and leave the entire field of a serene and beautiful sky-blue.

By now throwing in some diluted sulphuric acid, the same changes can be reproduced, and so on alternately for a number of times. Then, when the tank is clear, with an excess of acid, let fall a few drops of a solution of ferrocyanide of potassium from a small pipette, and rich red curdled clouds of ferrocyanide of copper will form.

2. Having rinsed the tank, or taken a fresh one with water in it as before, add to this some solution of litmus, until the whole acquires a purplish-blue tint. Now throw in very gently a little very dilute acid, and allow it to diffuse. On the screen will appear the image of a beautiful sunset sky, with its changing tints of drifting clouds.

When all has changed to red, add ammonia, and so reverse the change, which may then be repeated.

3. Proceed exactly as in the last case, but with a solution of cochineal in the place of litmus. The red color will then be changed by the acid to a brilliant yellow, and by ammonia to a rich purple.

4. Into a tank of water drop slowly a strong solution of the acid perchloride of tin. This on the screen will resemble the eruption of a submarine volcano.

When a pretty strong solution has thus been made in the tank, put in a strip of sheet zinc, and long leaf-like blades of metallic tin will at once be seen to shoot out in all directions.

5. The cohesion figures known as Tomlinson's make a very beautiful effect on the screen, one of the most pleasing being obtained as follows: —

Fill the tank with ordinary alcohol, and then drop slowly down the side of the tank a small quantity of some aniline color. The effect is that of a tree springing from the bottom of the screen and shooting out into endless branches. If two or three colors be used, the mingling of them adds much to the effect.

6. If the tank be filled with a saturated solution of Glauber's salts, or sulphate of soda, and allowed to cool, it will appear transparent on the screen, but dropping one small crystal into it will make the whole mass shoot out into beautiful crystals.

The crystallization of many other substances, such as bichromate of potash, alum, etc., and the precipitation of iodides of silver, mercury, and other salts, also form beautiful objects on the screen.

"ON THE ROOF."

It is a wonder that it never occurs to the enraged householder, when in the dead of night he is roused from sleep by unearthly caterwaulings over his head, that some of the anguish of the feline serenader may be caused by the bad construction or neglected condition of his favorite promenade. Instead of searching the premises for old boots and blacking-bottles, the time might be better employed, while sleep is beyond recall, in thinking how the roof-tree (the part of the house which should be the visible and prominent emblem as well as the actual means of shelter from the fury of the elements) can be made to answer its intended purpose. The ever-changing weather and the pitiless storms of our "stern New England coast" would naturally lead us, if we allowed ourselves to be guided at all by reason, to pay greatest attention to the construction and appearance of what may be called the hat of the house.

> "Wear a good hat; the secret of your looks
> Lies in the beaver of Canadian brooks."

And if the hat is so essential to the man, how much more important must the crowning finish be of the dwelling he calls home.

Although the look of shelter is secondary to the practical need of actual protection, it is well to treat of it first, because it is the simpler branch of the subject. To have a roof seem comfortable it must be visible. It must have a slant or pitch, steep enough to look as if the snow would slide or blow off and the rain run off readily, and there must be a sufficient overhang or projection to the eaves to give an appearance of protection to the walls, and to throw the water clear of the building. Even where gutters are provided this projection of eaves is essential, for there are many storms when the water is thrown from the roof in sheets, the ordinary gutter being entirely inadequate to carry it off.

Flat roofs are entirely unsuited to our climate, and are only justifiable in cases of necessity. Of course the steep pitch, entirely unbroken throughout its whole surface, is the best form; and all variations from this to obtain picturesque effects, or to furnish windows or gables to render the attics more habitable, are open to practical objections, as they increase the danger from leakage and the amount of care required both in construction and in repair; still these breaks are almost always necessary, and must be made the best of.

Although the slant of the rafters must vary in different cases to suit circumstances, still for practical purposes it should never be less than "a third pitch," that is, the height equal to a third of the span. It had better, of course, be much steeper; but if necessary this pitch will answer, and its covering can be made watertight by the exercise of proper precautions.

Having determined the shape and appearance of the roof surface, and arranged its form to fully suit its uses and its situation, in short, having made it *fit*, the next point is to decide upon the construction. Having made the rafters strong enough to bear their weight and the weight of boards and slates or shingles, and the force of the highest wind and the weight of the greatest snow, and having allowed a good margin of strength beyond, we come to the question of covering. It would be impossible within reasonable limits to treat of all the materials used for roofing. It is enough for the present purpose to consider briefly the two most commonly used, and likely to be for many years to come, for ordinary detached dwellings.

If it were not for the danger from fire, a well-shingled roof would on many accounts be the best as well as the cheapest protection, for all the smaller class of steep-roofed wooden buildings. Really good split pine shingles will last from ten to twenty years, or even longer in special cases, and, if properly put on at first, cost little for repairs. But a shingled roof takes fire readily, and until the happy day when some one discovers a practicable and cheap way to render

wood incombustible, the prudent, as well as the timid, will be prompted to use slates instead of shingles, even at a greater first cost and a chance of frequent repairs. But for a large class of detached buildings, especially of the cheaper sort and those in the country and by the sea-shore, shingles are a suitable roof covering. The best shingles are made of split pine or oak, and the poorest, perhaps, of sawed spruce. A split cedar shingle is very good. Shingles may be dipped in paint or oil to preserve them and give the roof a better color, and they may have the lower ends cut to half round or other patterns for ornamental effect. They should be laid not over five inches to the weather (four is better), and the roof should be previously covered, over the boarding, with a lapped thickness of "wood-tarred" or "rosin-sized" sheathing paper, to keep the fine snow from sifting through the crevices. It is a good additional protection to have the roof boarding tongued and grooved. One considerable advantage of a shingled roof is its lightness as compared with a slated one.

The "hips" and "ridges" should be protected by "saddle boards," and the valleys and places where roofs meet upright walls should be "flashed" with broad zinc "flashings." Around the chimneys the "flashings" should be turned well up against the brick-work, and sheet lead should be built into the brickwork and turned down tight over the zinc.

Of slates there are many kinds, colors, qualities, and sizes. Formerly all the slates used came from Wales; but good ones are quarried here now in abundance, and of course are cheaper than the imported. The "Brownville" (Maine) slate is as good as most of the Welsh, if not better, although the color, which is black and glossy, is disliked by some. A good slate should be even and smooth, and, when balanced on the fingers of one hand and struck sharply near the edge with the knuckles of the other, should emit a clear, ringing sound. A good comparative test is to immerse several specimens in water for some hours; on removing them the ones which have absorbed the least water are the best. Not only does the tendency to absorb and retain water indicate a soft and perishable nature, but the retained dampness helps to decay the roof boarding and rust the nails.

The size of slate should be determined by the character of the roof. On small roofs and those broken by projections the smaller sizes should be used; on large plain surfaces very large and heavy ones may be employed to advantage. The roof boarding for slating should be more firmly supported than for shingling, and for the best work should be one and a quarter or one and a half inches thick, instead of the ordinary board thickness. The tonguing and grooving of the boards and the covering of sheathing paper are even more important for slating than for shingling, as slates do not lie so close as shingles. Slating is double on a roof, except the laps, which are of triple thickness. The "lap" of slate, in this country, commonly means the distance from the top or head of the lowest slate to the tail or lower end of the upper one over it. The lap varies from two to four inches, according to the size of the slates and the quality of the work. For a medium size, say ten by sixteen inches, three inches' lap is a fair standard; that is, slates of this size should show six and a half inches to the weather.

Slates are secured to the roof by nails, two to each in ordinary work, or three for extra large sizes. The nails are of copper or composition, tinned iron, Swedish iron, or common iron. The two latter kinds are sometimes boiled in oil to prevent them from rusting. The copper or composition nails are used only on the most costly work. The tinned are considered good enough for all ordinary use. The principal objection to slates is their liability to get out of repair from the effect of wind, or snow and ice, or from breaking occasioned by walking on the roof. These accidents may be partially avoided by bedding them in cement or plasterer's mortar; a good coat of mortar over the whole roof not only keeps the slates firmly in place, but offers considerable resistance to the progress of fire.

The color of slates to be used is a matter of taste. They can be had black, blue, purple, red, green, and of various intermediate shades. Only time will show which are of fast color, but many kinds have been thoroughly tried, and it is easy to ascertain which are above suspicion of change. Very good effects are obtained by using stripes or figures of different colors, and where the roofs have large plain surfaces the broken effect of colored patterns soberly used is very agreeable.

The flashing of slated roofs is similar to that of shingled ones, except that metal is substituted for the saddle and ridge boards, and all the work requires rather more care. On the best work heavy sheet copper and lead are used instead of the cheaper zinc.

One of the most frequent causes of leaky roofs is the forming of an ice dam, beginning at the gutter and gradually backing up till the water flows through under slates or shingles. A simple way of preventing this is to detach the gutters an inch or two from the eaves and hang them on iron stirrups, or otherwise, so that the water can flow freely over the backs as well as the fronts.

But when all is said, the thing to prevent a leaky roof is "eternal vigilance;" first, in the thoroughness of construction; afterwards, in regular and careful inspection. Gutters and conductors must be kept clean and clear, and after snow-storms of peculiar severity or unusual character some part of the roofs must often be cleared of drifts. If the roof which is out of sight is also kept out of mind, it will make its neglected condition felt in both a disagreeable and an expensive manner. J. A. F.

SCIENTIFIC BREVITIES.

"Epipolar" Force. — When small pieces of camphor are placed on the surface of water, it is known that they turn about with the most capricious movements. This phenomenon has lately been studied by M. Lescœur, of the Chemical Society of Paris, in a number of other bodies. He arranges in two classes the substances that are endowed with the "epipolar" force, as he calls it: 1. Substances insoluble in water (fixed oils, fatty bodies, etc.); as soon as the spreading out has occurred, all movement is arrested, and the movement of any other body is suspended. 2. Substances soluble in water (camphor, acetic acid, essential oils); the superficial layer produced is dissolved or volatilized with more or less rapidity; the movement is continuous. The saturation of the liquid, and of the surrounding atmosphere causes all action to cease. The phenomenon is one of capillarity, or of the superficial tension of liquids.

Fires Caused by Iron Rust. — This seems a queer notion, but it is made quite plausible by a recent English writer, who says: "When oxide of iron is placed in contact with timber, excluded from the atmosphere, and aided by a slightly increased temperature, the oxide parts with its oxygen, is converted into very finely divided particles of metallic iron, having such an affinity for oxygen that, when afterwards exposed to the action of the atmosphere from any cause, oxygen is absorbed so rapidly that these particles become suddenly red-hot, and, if in sufficient quantity, will produce a temperature far beyond the ignitible point of dry timber. Wherever iron pipes are employed for the circulation of any heated medium (whether hot water, hot air, or steam), and wherever these pipes are allowed to become rusty, and are also in close contact with timber, it is only necessary to suppose that under these circumstances the finely-divided particles of metallic iron become exposed to the action of the atmosphere (and this may occur from the mere expansion or contraction of the pipes), in order to account for many of the fires which periodically take place at the commencement of the winter season."

Penal Electricity. — A recent English writer makes the following suggestion: "Now creatures in the likeness of men vent their despicable passions in murderous assaults upon women and children. But science hints at an effectual cure. It is probable that, before many years have passed, electricity, which by some mysterious means enables our nerves to call our muscles into play, which enables us to converse with one another at distances of thousands of miles, which alike plates the teaspoon and illumines the light-house, will be called upon by an enlightened legislature to produce absolutely indescribable torture (unaccompanied by wound or even bruise) thrilling through every fibre of such miscreants."

Acclimatization of Kangaroos in France. — In the Jardin d'Acclimatation, Bois de Boulogne, Paris, are some hundreds of kangaroos, recently arrived from Australia. The kangaroo has been introduced into several large estates in France, and is now hunted there like other game. The flesh is sold in the market, and is considered a great dainty.

Magnetic Curves. — Iron filings are recommended in all the books for making magnetic curves, but experimenters have found that magnetic oxide of iron is much to be preferred for this purpose. It is easily pulverized to any desired degree of fineness.

HISTORICAL MEMORANDA.

Chaldean Record of a Comet. — Apropos of Professor Young's interesting paper on Comets, in the present number of the Journal, we notice that at a meeting of the London Society of Biblical Archæology in December, Mr. H. Fox Talbot, F. R. S., read a paper upon a record of a very ancient comet found on a Chaldean tablet. He considered that this comet appeared in the reign of Nebuchadnezzar I, about 1150 B. C. The following is a translation of the inscription describing it: —

"1. The star is hairy; its orb is like a shining light,
2. and it has a tail receding from it like a creeping scorpion;
3. a great star from the northern horizon
4. unto the southern horizon
5. extends its measure like a creeping (scorpion's tail).
6. This on the face of the tablet (was written)
7. At the time when Nebuchadnezzar had marched into the land of Elam."

Cole on Coal a Century Ago. — The Rev. William Cole, who died in England about a hun-

dred years ago, bequeathed to the British Museum a hundred folio volumes of manuscript notes on miscellaneous matters of contemporary interest. *The Academy* quotes the following from a note of this antiquary on the increasing use of coal: —

"The smell of coals is now so frequent, and we are so used to it as not to be offended at it; yet I have often known country people, who are used to wood and turf only, know a person by the smell of his clothes to have come from a coal fire."

We believe, however, that the prejudice against coal smoke existed down to a much more recent date in France. A story is somewhere told of an English ambassador at Paris, within the last forty years, who issued cards for a large party, and found to his dismay that only gentlemen attended, the ladies having absented themselves on learning that his lordship warmed his house with English coal. The fear lest their fair complexions should be spoilt in such an atmosphere was well grounded, if we may accept as true the story of the fashionable lady who had incautiously seated herself too near a coal fire at a card party. Suddenly her countenance changed from a delicate white to a dark tawny, as though by magic. The surprise and confusion of the whole party had such an effect upon her that the poor dame began to apprehend that she was dying from the effects of some deadly poison; but the doctor quickly dissipated her alarm, with the recommendation to wash her face, and trust in future not to mineral cosmetics but to her own natural charms.

MICROSCOPICAL NOTES.

Crystallized Silver Slides for the Microscope. — A correspondent of the *English Mechanic* says that slides of crystallized silver, or arborescent silver, as it is more generally termed, may be readily prepared as follows: Bend a piece of thin bright copper wire into a ring of about ½ inch in diameter and lay on the centre of a glass slip. Into this drop a solution of nitrate of silver of about 20 grs. per oz. until it touches the copper. The formation of crystals will at once commence, and will continue until the whole of the silver contained in the solution is deposited in a metallic state. The ring should then be carefully removed and the crystals washed by immersing the slide for a short time in distilled water. When dry they may be mounted by surrounding with a cell and covering with thin glass in the usual manner.

According to another authority, these slides may be made by placing a drop of a solution of nitrate of silver on the centre of a glass slide, and bending a piece of copper or brass wire so that the point dips into the liquid. Beautiful feathery crystals of metallic silver immediately branch out, when the wire should be lifted with the utmost care, and the slide tilted and drained — an operation facilitated by breathing on it, and so damping the glass. It is better if the soluble salt is now washed away with distilled water; but this must be done dexterously, or there is danger of washing away the crystals with it. When dry, the slide is finished as above.

Counterfeiting in a New Field. — Microscopic slides are about the last things that one would expect to be fraudulent, but a correspondent of *The Academy* states that some of the Continental manufacturers, who have had a good reputation hitherto, are cheating their customers. It appears that many polariscope objects are offered for sale, purporting to be plates of minerals, which are nothing more than ingenious manipulations of colored glass and cheap minerals. Thus, spartalite, for instance, is imitated by means of a piece of dark red glass, on which is placed a thin section of calcite. The combination is then mounted in Canada balsam between two plates of glass. An optician at Berlin is said to have originated these ingenious slides.

Practical Chemistry and the Arts.

BIG GUNS.

Just at present there is a mania in Europe for the manufacture of enormous cannon. One would think that several of the great nations were trying to see which can bring out the biggest gun. When the English 81-ton piece was successfully completed, it seemed likely to hold the field for some time without a rival; but before three months have elapsed we find that Italy has ordered four 100-ton guns from Sir William Armstrong, and that Krupp, in Prussia, "has in hand" (figuratively speaking, of course, though Krupp is a giant in a business way at least) a monster of 124 tons. Of course John Bull does not mean to be outdone, and it is announced in the English journals that "the authorities at Woolwich are prepared to commence a gun of 160 tons as soon as permission is granted." What Krupp will say to this remains to be seen, but we should not be surprised to learn by the next German mail that he has "taken in hand" a 200-ton gun.

How much destruction all this formidable artillery is destined to cause when next the dogs of war are let loose in Europe we cannot predict; but it is certain that before they fire their first shot these big guns make big holes in the national treasury. The 81-ton gun has cost $75,000, and the price named for the "Newcastle infants" of 100 tons for the Italian navy is $120,000 each. We have not seen it stated what the Krupp monster is to cost, but it will probably be $150,000 or more.

The testing of these guns, to say nothing of their use in actual service, adds not a little to this enormous expenditure. Every time the 81-ton piece is fired, it blows $125 into the air, 240 pounds of powder and a projectile of 1260 pounds being the charge in the first trials. In some of the rounds, 250 pounds of powder and a 1465-pound shot were used. It is now proposed to increase the bore of the gun from 15½ inches to 16 inches, after which operation the charge will be proportionately augmented.

The Italian guns are to fire projectiles of 1860 pounds each, while the Krupp cannon will send a ball of 1040 kilograms, or about 2300 pounds, through the air; but how much powder is to be used in doing it we are unable to say. One gets, however, a new idea of the power of gunpowder when he learns that a few hundred pounds of it can propel a missile of more than a ton's weight over a distance of several miles. In the case of the 81-ton gun, the shot of 1260 pounds left the muzzle with a velocity of 1400 feet a second, and a momentum that would carry it through 20 inches of iron plating at a range of half a mile.

The Duilius, for whose armament the four 100-ton Armstrong guns are intended, is described as being the most powerful iron-plated frigate ever yet devised. She is to be armored with plates 19 inches in thickness, and moved by engines of 7000 horse-power.

NEW THINGS IN THE ARTS.

A Substitute for the Sand-Box on Locomotive Engines. — We see that Mr. W. Miller, the locomotive superintendent of an English railway, has been experimenting on the use of hot water from the boiler, instead of sand, as a means of promoting adhesion on railways. His experiments have convinced him that were his apparatus applied to locomotives it would entirely supersede the use of sand, for according to Mr. Molesworth's rule he gains 350 pounds per ton on each coupled wheel during frosty or "greasy" weather. Mr. Miller would have patented his apparatus had he not discovered that a similar idea was registered many years ago.

A New Illuminating Apparatus. — Professor Balestrieri, of Naples, has invented an apparatus to which he gives the formidable name of *Phototermicoarmillare*. It is for collecting any kind of light into a centre for scientific or practical purposes. It has the form of a large disk, composed of numerous polished rings of copper and white metal in such a way that each throws the light rays received to another, so that they are united into a large bundle of rays with considerable force of projection. The apparatus is said to far excel all previous light-collectors, particularly those of Fresnel. In experiments with lamplight, which have been repeatedly made with the apparatus at Naples, an illumination was obtained from a very weak flame which sufficed, at 1000 metres' distance, to enable one to read ordinary print on the darkest night. A company has been organized for practically utilizing this invention.

Another New Electric Battery. — This apparatus, invented by two Frenchmen, is contained in a square glass jar. The pile is composed of a prism of charcoal which contains sesquioxide of iron in its pores, and a small rod of amalgamated zinc. The latter passes through the stopper, to the under surface of which is fixed the charcoal. A solution of ammonium chloride is used as the exciting fluid. The reactions are the same as in Léclanché's couple, in which oxide of manganese is used. When the circuit is closed, the chloride of ammonium attacks the zinc, forming a double chloride of zinc and ammonium. The latter, on being set at liberty, decomposes the sesquioxide of iron, carrying off a part of its oxygen and forming free ammonia which disappears by evaporation. This pile ceases to act so long as the circuit remains open. Its durability and force are large. Its electromotive power is as 12 to 10 of the sulphate of copper battery, and it is thus well adapted for industrial purposes.

Nickelizing Lightning Conductors. — Conductors are usually made of an iron rod terminated by a point in platinum or gilt copper. Made in iron the point would oxidize rapidly and soon disappear. But in using two metals there is the disadvantage that contact between them is frequently defective, and if it were possible, the lightning rod should be made of one homogeneous metal, without welding or solution of continuity. This is realized by M. Saint-Edmé, who makes his conductor of a single rod of iron, in one piece from end to end, coated partly or entirely with nickel. The latter metal does not oxidize in damp air, it is a good conductor, and adheres closely to iron. The process of nickelizing is one easily and cheaply effected.

Nickelizing the Mariner's Compass. — To preserve the steel parts of the compass from rust, M. Duchemin covers them with a coating of nickel, finding that silver or gold plating offers a certain resistance to the passage of the magnetic current. An experimental compass was made by him, some of the rings in which were nickelized, and others left unprotected. The compass was then placed on board the frigate La Creuse, which went round the world, and brought home the compass in the condition predicted for it, the unprotected rings being rusted, the protected ones perfect.

To Clarify Liquors. — The following process for clarifying spirituous liquors, described in *Dingler's Journal*, is the invention of Franz Plattner, of Dittersdorf, in Bavaria. After the digestion of the proper ingredients for the manufacture of any

given liquor with common potato whisky is finished, and a sufficient quantity of so-called farina sugar has been added, the liquor is decanted or racked off, and to every eight litres there are added one ounce of pure starch, one half-ounce of prepared albumen in an extremely fine powder, and one half-ounce of milk-sugar: the whole is well shaken several times and left standing for twenty-four hours. At the end of this time the liquor thus prepared is so clear that it requires no filtering, has a peculiar lustre, and is so free from every trace of fusel-oil that it is superior in firmness and flavor to any imported from France and Holland.

PHOTOGRAPHIC NOVELTIES.

Professor Vogel, in his letter from Berlin to the *Philadelphia Photographer* for January, says: —

You are aware there is no lack of photographic news; but the queerest and most wonderful is, perhaps, the trial of photographing musical sounds. The matter seems to be most incredible, but the possibility of it is shown. König, a physician at Paris, has constructed an apparatus consisting of a little drum, over which is stretched a very elastic skin. A stream of gas let through this drum will burn as usual, but as soon as a tune (by singing) strikes the skin stretched over the drum, the gas-light commences to shake in a wonderful manner; and if we look at it in a rotating mirror, we observe peculiar figures, which change according to the different notes; and by using a burning gas producing a light of great chemical effect, we can photograph these peculiar figures. What kind of gas will answer for this purpose is still an undecided question, but this much is certain, there are in this respect great problems yet to be solved; we may succeed, perhaps, in photographing speeches instead of stenographing them as usual.

The Paris correspondent of the same journal ends his letter with this bit of combined chemical and photographic intelligence: —

M. Gobert, *attaché à la banque*, gave a very interesting and instructive lecture on the manner employed at the Bank of France to detect forgeries. He informed us that although the insoluble part of the ink had been erased or scratched off, the soluble part had penetrated into the fibres of the paper; and although invisible to the forger and to the public eye, still the writing could be easily renewed by a simple chemical reaction, and the forgery detected. He then passed round a piece of paper upon which had been previously written a certain sum, which had been scratched out and replaced by a larger one. M. Gobert dipped this paper into a solution of ferrocyanide of potassium, and after having held it for a few minutes over the fumes of hydrochloric acid, all the first-made figures became visible.

This chemical reaction cannot always be employed, as a valuable paper might perhaps be spoiled, so photography is called in to bear witness against the forger. A reproduction of the false note is made, and on the negative can be seen the form of the obliterated writing. M. Gobert presented several false bank-notes, with their reproductions, the authors of which were discovered and condemned through photography; these men are now at Cayenne, reflecting upon the extraordinary power of that science which discovered so easily what they had taken so much time and pains to hide. It may truly be said here that light was thrown upon their actions.

PRACTICAL RECIPES.

Fixing Pencil Drawings. — The *English Mechanic* gives the following minute directions for doing this: "Lay the drawing on a sloping board, and pour boiling water gently over it; this will remove all superfluous particles of lead, and will bring some of the size in the paper to the surface; boil some isinglass or gum-arabic in water to make a very thin size; pour it out on a flat dish to cool; run the drawing through the size, taking care that every part of it is well wetted; then lay it on a board to dry. The size should be so thin as to feel just a little sticky between the thumb and finger when cool. If too thick it will be seen on the drawing after it is dry. I have tried many ways of fixing drawings, but have never found any equal to this."

A correspondent says: "The best solution to fix drawings is that made with gum tragacanth. 1st, it sizes the paper; 2d, it fixes the pencil drawing; 3d, it does not chip when wetted; 4th, it enables you to continue the drawing afterwards if desired; and 5th, it is possible to color over it."

Copying Ink Requiring no Press. — Take one ounce of coarsely broken extract of logwood, and one drachm of crystallized carbonate of soda; heat in a porcelain vessel with eight ounces of distilled water, until the solution is of a deep red color. Then remove from the fire and stir in one ounce of glycerine, fifteen grains of neutral chromate of potash dissolved in a little water, and a mucilaginous solution of two drachms of finely pulverized gum-arabic. This ink keeps well, and does not attack steel pens. The impression is taken on thin, moistened copying-paper, at the back of which is placed a sheet of writing-paper.

Agriculture.

THE CHEESE MANUFACTURE.

The magnitude of the cheese manufacture in this country is probably not correctly understood except by those who are interested in some way in the production of the article, or in its sale. It is only those connected with any one of our industries who comprehend their vast extent and importance. The erection of cheese factories within the past fifteen or twenty years, in all the States where grazing is possible, has developed this industry to a wonderful extent, and our cheeses now command in England a ready sale, and they have become a large article of export. Cheshire cheese and Yorkshire hams were never plentier in England than at the present time, and many of the innocent consumers in that little island are asking some impertinent questions as regards the capabilities of these famous counties to supply such vast quantities as are on sale, duly labelled, everywhere. Undoubtedly so long as the resources of our cheese and pork factories hold out, the people of England will have an abundance of the Cheshire and Yorkshire products, even if the population of the country is doubled. We came in contact with a sly grocer and meat dealer when last in England, in one of the middle counties. Happening into his shop just as a customer had purchased a genuine Yorkshire ham, we asked what difference in price he made between the Yorkshire and the American hams. "Well, about twopence per pound, sir," he replied. "Is there any special difference in the quality of the two products?" "Oh, yes; we have customers that will have the Yorkshire, sir; can't sell 'em the American." After looking over his stock, and being convinced that all came from the same source, we said, "Look here, now; your Yorkshire hams, I perceive, are all shipped to you *via* New York, and are a very close imitation of the genuine article; you really have but one kind in your stock, and they are all of American production." Perceiving that his interrogator was from the "other side of the water," he at once confessed that not only all his hams, but his Yorkshire cheeses, also, were of American origin; but he must cater to English prejudice, and when home products were demanded, he must furnish them, even if he was compelled to charge twopence per pound more than when the same article was sold under its true name.

In remarking upon the large production of cheese in this country, we do not intend to afford an idea of its magnitude by an array of statistical figures, but by another method. It is well known that if a bit of the lining membrane of a calf's stomach, or *rennet*, is placed in milk it precipitates the caseine rapidly, and this, called the "curd," is employed to form the cheese. Now, if we take an ounce of this membrane and wash and dry it thoroughly, and then put it into eighteen hundred ounces of milk, heated to 120° F., we shall find that in a short time coagulation of the milk is complete. If we remove the membrane from the curd, again wash, dry, and weigh it, it will be found that it has lost only about *one seventeenth* part of its weight. It is thus proved that one part of the active matter of the stomach has coagulated about *thirty thousand* parts of the milk. In this statement we obtain some idea of the small quantities of rennet required to influence large quantities of milk, and it would seem that comparatively little of the article would be required in our largest cheese factories. But such is not the case. The traffic in calves' rennets is immense, and the supply in this country from the millions of calves which are slaughtered is wholly inadequate to meet the demand. We come short of furnishing to our cheese factories enough rennets by several *millions* annually; and consequently they are imported from England, Ireland, Germany, Bavaria, France, etc. A large business is done in the importation of rennets, and from all sources a supply of good, sound, healthy rennets is scarcely afforded. This is truly an astonishing fact, and serves to illustrate in a forcible manner the great extent of our cheese industry. Our dairy products are constantly increasing, and it is only necessary for farmers to make *the best* butter and cheese, and markets for their sale at good prices will be always open.

AGRICULTURAL EDUCATION.

How can we increase the productiveness of the land? asks an inquirer in *Nature*. There are many ways in which progress may be effected, but we must seek the solution of the question mainly in education, using the word in its widest sense. The wealth of farmers depends on their knowledge, skill, and thrift. Skill is required by both farmers and laborers. It is a plant of slow growth. The artisan acquires it by plodding application. The skill of the first-class agricultural laborer is acquired in the same way. The skill of the first-class farmer, too, is the result of continuous application to business. The skill acquired by one generation is capable of being imparted to, and of being improved upon by, the next. It would be unfortunate if any circumstances or set of circumstances should interfere with this development.

It has been affirmed that general knowledge imparts power to every man. This is true in every state of life. It is true in science; it is

equally true in the industrial arts. The proposition is supported by an overwhelming mass of evidence. All our systems of technical education are based on this one leading idea. In the chief cities and towns the rising generation of the manufacturing classes can acquire scientific knowledge which will be of direct use to them in their several pursuits. In the village school scientific truths are imparted which cannot fail to be of use to the trader and artisan.

How different is the case with the farmer's boy. In his education no systematic effort has been made to instill into his mind those elementary scientific truths on which enlightened agricultural practices are based. The result is that he grows up in complete ignorance of the rudiments of agricultural science.

How is this state of things to be remedied? In other words, how is a suitable amount of agricultural science to be imparted to farmers?

In answering this question it is important to distinguish between ordinary working farmers who receive their education in common schools, and farmers who are able to pay for a higher education, such as is afforded in colleges and seminaries and other institutions of the same grade.

As regards the first of these two classes, there is no reason why an adequate amount of agricultural instruction could not be imparted in the common schools. All that is required is a suitable text-book or two, and such a system of inspection as will insure that the book shall be read, and all difficult passages explained by the teachers. This simple system of agricultural education has been tried in Ireland for many years. It has labored under many difficulties; but it has succeeded admirably wherever it has been fairly tried. In a movement of this kind all sorts of people will come in with all sorts of advice; the busiest and most active of these may be ignorant of the A B C of science and of enlightened agricultural practice. Keep clear of these people. If not, you will either fail altogether, or effect little good, like many others who, from time to time, have embarked in agricultural education.

The words "agricultural education" have led to much confusion of thought. Some persons use them in a way which would imply that the farmer should have a special system of education peculiar to himself, from the moment he enters school till he leaves it for good. Of course this is not true, and it is certain that in the case of large farmers we must look more to the effects of a good general education than those of special instruction. The first truths of physical science, of chemistry and natural history, should enter into the curriculum of the common schools. This knowledge will be useful to the student, no matter what his future calling may be. As regards the farmer, it may be remarked that without a knowledge of mechanics he cannot be in a position to buy implements and machines to the best advantage, or to understand how to apply horse-power and other forces in the most judicious manner. Look, for example, at the loss of power daily caused by ignorance of the elementary principles involved in common draught. Look at the loss entailed on farmers in the simple matter of common gates, for want of knowledge of the means of resisting strains, and of other principles equally elementary. It is certain that in the production of animals and plants very great mistakes are committed for want of knowledge of physiology. This science should, therefore, be taught in all our public schools attended by farmers' boys. We must not, of course, neglect mathematics, the study of which is the very best training for the mind. If the farmer be well-instructed in all the sciences named, agriculture will keep pace with other pursuits in which scientific knowledge is required. It is to the universal inculcation of this scientific knowledge that we must look mainly for progress in the management of large farms. We do not wish to undervalue special agencies for imparting agricultural knowledge, such as agricultural colleges and agricultural schools. Viewing the subject theoretically, one of these institutions would seem to be the most perfect place at which the future farmer could spend a year or two after leaving school, and before he enters into practical work. He could attend lectures, and he ought, one would suppose, to be able to see theory reduced to practice. But their theoretical value has not been realized in practice. In point of fact, taking them as a whole, their history has been peculiarly unfortunate. At present it is enough to state that with few exceptions agricultural schools and colleges have failed; and success in the exceptional cases has turned upon the peculiar fitness of the individuals on whom the management has devolved, and who by force of character have produced striking results.

Among the best and most successful of agricultural colleges must be named our Massachusetts state institution, and this arises from its having at its head an efficient and competent gentleman. In fact, the entire corps of teachers are exceptionally good and practical.

CHANGE OF COLOR IN FLOWERS.

The English horticultural journals are discussing the cause of the change of pink hydrangeas to blue when transplanted from one soil to another. The phenomenon came under our notice in this country a quarter of a century ago. A hydrangea taken from Newburyport to Lowell and re-potted in the latter place underwent this change, and we have since known of similar cases in other localities. A correspondent of *The Garden* asserts (and we have read or heard the same explanation before) that iron in the soil causes the metamorphosis. He says: —

"Get some rusty nails and iron-filings, steep them in water, and use the water once or twice a week while the plants are growing. I remember a bank, in South Wales, on which we used to have blue hydrangeas in perfection. It consisted chiefly of refuse from iron furnaces, and if we removed the plants to another part of the grounds, instead of producing blue flowers, they gradually reverted to the usual pink form."

It is certain that the addition of iron to the soil augments the brilliancy of color in many flowers. The scales that are hammered by the blacksmith from heated bars of iron are excellent for this purpose; or the iron turnings and filings of the machine-shops may be used. Mixed with the earth they soon dissolve, to reappear in the more vivid coloring of the flowering plants that draw their nutriment from the ferruginous soil.

Silica has a similar influence. Sand or sandy loam, with the addition of potash (which may be supplied by wood ashes) to render the silica soluble, will often produce a marked increase in the beauty of leaf and petal. Charcoal also brightens the colors of certain flowers. It is well known, for instance, that soot or small bits of charcoal mixed with the soil in which cyclamens are potted will make the blossoms richer in hue.

A THOUSAND POUNDS OF POTATOES FROM ONE.

We have before alluded to the extraordinary yield of 1082 pounds of potatoes from one pound of American seed. The statement called forth many expressions of incredulity in England, being considered as nothing more than an "advertising dodge" of the seedsmen who controlled the sale of the Yankee varieties alleged to have produced such wonderful results. There were some authorities, indeed, that declared the enormous increase an impossibility. To put an end to this doubt and unbelief, Mr. Ford, who raised the potatoes, has published a detailed account of the method employed. The following is the story in a condensed form: —

I had not a plot of sufficient size that I could devote entirely to these potatoes, but there was a piece of ground, 84 feet by 32, that had previously been occupied by cauliflowers, and on which I intended to plant celery, and it occurred to me that celery and potatoes would grow together. On this ground I put about six cartloads of charcoal dust, lime rubbish, and old mortar, and a liberal dressing of hot-bed manure. The ground was then dug in the usual way, care being taken to make it as fine as possible. When the surface had become dry enough to work well, trenches for the celery were marked out, 15 inches wide, the spaces between them being 33 inches. The spaces between the trenches were then given a slight dressing from an old mushroom bed, and again dug, so as to thoroughly incorporate the manure with the soil. The trenches were then taken out in the usual way, and, when completed, the tops of the ridges were two feet in width. There were eight trenches and seven ridges, and on six of these ridges I planted the pound of Eureka potatoes that produced 1082½ lbs.; the remaining ridge was planted with a portion of a pound of Snowflake, and the remainder of this pound of Snowflake was planted on an old vinery border, which, being very rich, received no extra preparation. Both varieties were planted on the 13th of April. I purchased two lbs. of each variety from Messrs. Hooper in March, and on receiving them they were placed in seed drawers, with the base of each tuber uppermost. This was to encourage the eyes at that end to start as early as those at the other, or growing end, which they will not do if laid on their sides, or with the growing end upwards. They were slightly syringed daily with warm water, and soon began to grow. When sufficiently advanced I examined each tuber, and carefully removed, with the point of a knife, the centre bud from each eye. This shoot was of no use for planting, my object in removing it being to induce more than one bud to grow from each eye. When I cut the potatoes into sets, I was able, with great care, to cut three, four, and, in some cases, five sets from one eye. As I had two lbs. of each variety, I chose those tubers from which I could obtain most sets, and then invited a number of persons (almost a score) to see them cut, weighed, and counted. The number of sets obtained in this way was, from one lb. of Snowflake, 169; from the same weight of Eureka, 252. This was in no way an infringement of the conditions, one of them being, "the potatoes may be cut into sets." Of course these sets were ridiculously small, many of them not being so large as horsebeans. On the following day the sets were again weighed, and counted at

the time of planting. They were planted two feet asunder down the centre of the ridges. In about a fortnight the Snowflakes began to show themselves above ground, followed in a few days by the Eurekas, but they were so remarkably weak at first that I was ashamed of them. Early in May I gave each plant a light dressing of guano, stirring the soil about them, and giving a good watering at the same time. This was repeated twice, at intervals of about ten days, while the weather remained hot and dry. So surprisingly did the haulms extend that by the middle of July they met across the celery trenches, a distance of four feet, and I saw that if left alone the celery (planted in June) would soon be killed altogether. The celery being a more important crop to me than the potatoes, I was compelled to keep the latter within bounds by driving stakes on each side of the rows, and passing cords from one stake to another. By so doing I managed to confine the potatoes to a yard in width. The severe thunder-storms and heavy rains during July and August made sad havoc among the earlier potatoes in many districts, and fearing that these would become badly affected, I had them lifted before they were fully ripe. Snowflake, being the earlier variety of the two, was lifted on August 13th, exactly four months from date of planting, the produce being 638 lbs. from 161 roots, eight of the sets having failed to grow. Eureka was lifted a week later, producing 1082½ lbs. from 235 roots. Both varieties were lifted and weighed in the presence of a number of tenants on my employer's estate, who, being themselves great potato growers, had taken an interest in this experiment. I consider it quite possible, with greater choice of seed and more room, to grow 1300 lbs. of Eureka from one lb. of seed. Of the good or bad qualities of potatoes grown in this way I cannot speak, quantity alone having been aimed at.

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NOTES AND MEMORANDA.

An Old Oak Killed by Ivy. — Mr. J. Ollerhead writes from Wimbledon House to *The Garden* as follows: "We have a fine ivy-covered oak-tree in the grounds here. Its trunk, at 4 feet 6 inches from the ground, measures 26 feet in circumference, and the spread of its branches, the widest way, is 55 feet in diameter. The whole, with the exception of two small branches, is clothed with ivy, which is now loaded with berries. So thoroughly has the ivy gained the mastery over the oak, that the latter has for some years past been fast falling into decay. The only portions that retain any vitality are two small branches, which this year produced a quantity of acorns. It is the finest specimen of the kind I ever saw."

Fruit Eating. — A London journal remarks: "When fruit does harm, it is because it is eaten at improper times, in improper quantities, or before it is ripened and fit for the human stomach. A distinguished physician has said that if his patients would make a practice of eating a couple of good oranges before breakfast, from February till June, his practice would be gone. The principal evil is that we do not eat enough of fruit; that we injure its finer qualities with sugar; that we drown them with cream. We need the medicinal action of the pure fruit acids in our system, and their cooling, corrective influence."

Acid produced by Plant Growth. — If seeds (barley, wheat, or other) be placed between moist pieces of litmus-paper, the roots stick to the paper, and color it so intensely red that even on the back of the paper their course can be traced in red lines on a blue ground. If tincture of litmus be repeatedly added, the intensity of the red color is increased, M. Cohn thus demonstrated lately the separation of a strong non-volatile acid by the roots.

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TYNDALL AND HIS ASSAILANTS.

No one of the distinguished scientists of our time has been so environed by adversaries and assailants during the past two years as Professor Tyndall, and certainly no man has been busier in defending himself. His assailants have been largely theologians: clergymen of the English church, and Catholic bishops. Tyndall, at the Belfast meeting of the British Association, as is well known, boldly launched out in his address into the sea of materialism, and his craft has been fired into by some of the sharpest theological cruisers which are known in any sea. His last act of defence is a broadside fired at the Rev. James Martineau, a distinguished and able Unitarian clergyman, of England.

In this paper, recently published, Tyndall, in language forcible and eloquent, undertakes to vindicate himself from the charges brought against him by Martineau and others, who accuse him of materialistic utterances in his Belfast address. We cannot see the need or expediency of this new defence, neither can we see that he gains any points by it. It is but a re-utterance of what he has said before, although the points are presented in new language and with new illustrations. Tyndall is unquestionably one of the most accomplished controversialists of the age. Certainly no one of his associates in science, unless it be Crookes, can be compared with him. We have always regarded Professor Crookes's reply to that learned but conceited author, William B. Carpenter, as one of the most incisive, eloquent bits of criticism that ever came under our notice. Tyndall's command of language is wonderful, and there is just enough of irony and sarcasm in his sentences to hold the attention of his readers and win their applause. His logic is good, and his erudition vast and comprehensive.

His disingenuousness lays him open to criticism. It is evident in every line of his last defence that he holds the theologians and the Hebrew Scriptures in perfect contempt. He has not the slightest respect for either, and yet he has not the courage to plainly say so. He wishes to pummel his assailants, their doctrines and beliefs, and at the same time he pretends to yield a kind of general assent to some of the fundamentals of the Christian belief. Tyndall is a materialist, and all his arguments and illustrations go to prove this. His views, as they are shadowed forth in his several "replies" and defences, are cold and gloomy. They leave us "poor humans" to be consigned to the dust, without any hope of further consciousness. We are to rest in oblivion like the rocks, or the structures in which we dwell. As a physicist he is unable to devise apparatus capable of demonstrating the existence of a soul; and therefore there is none. He believes in law, in nature, in atoms, in the "potency of matter," but nowhere in the universe does he discover a God.

This result does not satisfy us. We believe there is an intelligence in the universe which exists behind matter, and which controls all its movements and changes. The existence of this Supreme Intelligence, this Divine mind, is not to be proved by the mathematician, neither is it to be made positive to our understanding by spectroscopes, telescopes, or microscopes. All our mathematics and philosophical appliances can never penetrate behind the veil which hides spirit from matter. It is faith alone which in the shadowy land guides and holds us up; and if faith is "blind," it is instinctive and pervasive, and is moreover elevating in its influence. We rejoice that "faith" is in the world.

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WHAT IS MATTER?

If the question, What is matter? was asked of a school-boy, he would have no difficulty, guided by his text-books, in replying, "Matter is what we see about us in a thousand different forms; it is what we feel, taste, smell; matter is composed of different elements, in simple or composite forms, and the number of the elements is about sixty-five." This all sounds very well, and is doubtless quite satisfactory to school-boys and their teachers; but it is quite *un*satisfactory to advanced students in the field of chemical investigation. The question, What is matter? is very far from being settled, and there has never been a time since the father of chemistry, Lavoisier, suggested that there might be, after all, but *three kinds* of matter in existence (hydrogen nitrogen, and oxygen), when the problem has been more earnestly studied than at present.

The investigation of the nature of matter is exceedingly difficult, and it is only by the opening of some new departments of knowledge that we obtain any insight into the dark problem. It has not been until within a few years that a knowledge of the influence of heat upon bodies has been had. We now know that heat has the power of unloosing the bonds of chemical combination. Water under the influence of intense heat is no longer water, or steam, but exists in gaseous form. What we call the law of chemical affinity is suspended, or broken up, and oxygen and hydrogen, separate and independent, occupy the place of the water. Hydrochloric acid, potash, and every substance regarded as compound, are doubtless capable of being resolved in the same manner. Laboratory manipulation is capable of conducting experiments up to the point of separating by heat complex bodies into simple ones, or rather by the agency of heat we can dissociate compounds and resolve them into elementary forms. Further than this, science does not permit us to advance at present. There is no known method by which an element, so called, can be changed into a simpler form. We have in ozone an example of an element changed in its nature and capabilities by art, but it is not presumed to be in a more simple condition.

Thus far we have spoken of elements, or forms of matter assumed to be separate and distinct, each having its own peculiar characteristics. Is there really more than one kind of matter? may

not matter as it manifests itself to our senses, in sixty or more forms, be resolvable into one universal, primary agency, or influence, as intangible and incomprehensible as light? We now understand that light, heat, and electricity are identical, and capable of being transformed by art one into another at will. It is but a few years since this great truth was clearly understood, and we incline to think that before another chemical centennial occurs in Pennsylvania, our knowledge of the nature of matter will be so greatly advanced that our present chemical text-books will be regarded as rare curiosities, more amusing than anything preserved in the literature of a past age.

Everything points in the direction of great simplicity in the arrangements and constitution of the universe. In the nebulæ, which beyond question condense into suns and planets, the future worlds which are to commence their long journeys in space, there can be discovered but two or possibly three elements. In these two or three elements are the germs of what to human apprehension constitute a multiplicity of forms of matter. As now the constitution of the nebulæ is made known to us through the aid of the spectroscope, we find nothing but what is contained in our air and in aqueous vapor; and may it not be, as suggested by Sterry Hunt, that our atmosphere and ocean are not simply terrestrial, but cosmical, and a portion of the medium which in an attenuated form fills the interstellar spaces? Is there not a universal atmosphere composed of a simple form of matter, out of which, by chemical condensation, the worlds are evolved? Something like this is probably true, and the sources of knowledge which are now opening in all directions will probably before many years afford opportunities of demonstrating some most important facts in nature, bearing upon this interesting question.

THE LESSON OF THE LONDON PUMPS.

The good people of certain quarters of London have been much stirred up of late by the attacks of malicious sanitarians upon the reputation of the venerable town-pumps. A famous old pump at the East End, known as "Aldgate pump," was the first against which these officious people, who want to interfere with the inalienable right of their neighbors to poison themselves, directed their spite. Now the water of this ancient well has a traditionary celebrity in the district; so much so that many of the inhabitants consider that a morning draught from it is a sovereign remedy for certain ailments, and send for the water from long distances when they feel "out of sorts." The flavor and appearance of the water are in keeping with its good name. It is clear, sparkling, and has a cool, saline flavor which is very agreeable to the palate, and which is harmless enough when the saline ingredients are not accompanied by organic taint. In this case, however, the analysis made by Professor Wanklyn shows that the cool, refreshing flavor is due to the impregnation of the water with salts derived from decomposing sewage, which evidently finds its way into the well, partially filtered and decomposed by the surrounding soil. The soil itself is heavily loaded with organic matter, and does not form an efficient filter; thus the water is polluted with a considerable amount of organic matter. But, for all this, the popular feeling in its favor is so strong that resistance has been made, on the ground of certain "city privileges," to closing the well, and it is said that an appeal to the home secretary will be necessary to prevent its further use.

This case led to an examination of the other London pumps, and Dr. Frankland states the results in a letter to the *Times*. Samples collected from all the known shallow wells in the metropolis, having been analyzed in the laboratory of the Rivers Pollution Commissioners, were proved, with but two exceptions, to consist chiefly or entirely of the soakage from sewers and cesspools, and some of them actually had a manure value 150 per cent. greater than that of average London sewage! One or two had a slight saline taste, piquant to some water-drinkers, but most of them were bright and palatable, and the pumps yielding them enjoy, for the most part, as high a reputation with street connoisseurs as Aldgate pump has had.

These facts are worth recording as curiosities of history in this nineteenth century, but we allude to them mainly for the sake of emphasizing what we have more than once urged upon the attention of our readers, namely, that very bad water may not seem to be bad, but on the contrary very good, when judged by its taste and smell. Of two wells in a neighborhood, the one that has the better reputation for purity and flavor may be poisonous; while the other, which is less palatable, may be so simply because it is purer. A friend of ours was walking last summer in the suburbs of Boston, five miles from the city, and stopped to drink at a wayside well. The owner, who was at work near by, kindly suggested that there was "a good deal better water at the next house." That well was found to be located within six feet of a privy and on a lower level, to which a flight of steps led. The privy was of the usual rural type, with nothing to prevent the filtration of its contents into the adjacent soil. Our friend did not taste the water, but very likely it might have proved more palatable than that of the other well, though the latter, which was in an apparently unexceptionable location, was no doubt much the purer.

This was by no means an extreme or exceptional case. There are thousands of wells in New England which receive the filtrations of privies, cesspools, or barn-yards; and Heaven only knows of how much disease their polluted waters, with all their deceptive clearness and purity of flavor, may be the source. They are unfit for the use of man or beast; for domestic animals are as dependent upon pure water as their owners are. It is not unusual in New England to have a well in the barn-yard for watering cattle, while the family supply is drawn from another well, which is at least supposed to be, though often it is not in reality, more favorably situated; but this course is equally cruel and short-sighted. The merciful man is merciful to his beast; and this mercy is "twice blessed," for, like honesty, it is the best policy. Sound health is always a shrewd investment, not only for ourselves but for every living creature whose welfare is bound up with our own; and to neglect or ignore anything conducive thereto is as unthrifty as it is inhuman.

FRIENDLY WORDS FROM OUR CONTEMPORARIES.

The New Year brought us many kindly greetings from our brethren of the press, for which we return our grateful acknowledgments. We cannot reprint them to any great extent, but give two or three to show their general tenor. The following is from *The Technologist:* —

This sprightly journal is now in its tenth volume, and has constantly gained in public favor. The aim of the editors is to give a monthly record of progress in physical science, and also to give popular and easily comprehended accounts of the great discoveries that are constantly being made. In this respect they have succeeded admirably, and each month they present a table of contents which, while of great value to the practical man, is of deep interest to those who take merely a general interest in scientific subjects. To us it is no surprise that the circulation of the Journal of Chemistry has attained extraordinary proportions, for the editorial work has been well and conscientiously performed.

The *Manufacturers' Review*, edited by Dr. Isidor Walz, one of the ablest chemists in the country, says: —

The Boston Journal of Chemistry is a very popular monthly, ably written and well conducted. It is sometimes rather difficult to make chemical topics clear and interesting to the average reader, but the Journal always succeeds in doing so.

The *American Builder* pays us this high compliment: —

One of the best practical journals for the shop, farm, or fireside is the Boston Journal of Chemistry, issued monthly at one dollar a year. We feel quite sure that the readers of the *Builder* would appreciate and subscribe for it if they knew its value.

ANALYSIS OF GEYSERITES.

Professor G. E. Bailey, of the University of Nebraska, sends us the following analysis of two geyserites; the first from the Giant Geyser, and the second from Castle Geyser, Yellowstone Park: —

No. 1. H; 6. Sp. gr. 2.565.	
Silica	92.35
Alumina	.28
Magnesia	1.35
Water	6.35
	100.33

No. 2. H; 5.5. Sp. gr. 2.204.	
Silica	84.58
Alumina	3.85
Iron	.97
Lime	1.35
Water	9.25
	100.00

EDITORIAL NOTES.

Science at the Lowell Institute. — The scientific courses before the Lowell Institute of this city, the present season, have been a prominent and attractive feature of the programme. Mr. R. A. Proctor's twelve lectures on Astronomy were followed by six on Forestry by Dr. F. B. Hough, noteworthy as being the first course on the subject ever delivered in this country. At the present time two courses, of twelve lectures each, are in progress: Prof. Sanborn Tenney's, on Geology; and Prof. C. A. Young's, on Popular Astronomy. The large and attentive audiences at the latter, following so closely upon Mr. Proctor's course, are proof both of

the ability of the lecturer and of the popular interest in the subject.

THE HARVARD SUMMER COURSES OF 1875. — Among other interesting information in the *Harvard University Catalogue* for the present year, we find a report of the results of the "Summer Courses in Chemistry, Botany, and Geology" for 1875. The instruction in chemistry (including mineralogy) was given at the college in Cambridge, four hours each day for five days in the week being devoted to it, from July 8th to August 19th. The subjects taught were general chemistry, qualitative and quantitative analysis, blowpipe analysis of minerals, crystallography, and the study of specimens. There was no regular class system, the instruction being adapted to the varied wants and attainments of the pupils, forty in number, twelve of whom were ladies.

In botany there were two courses; one in phænogamic botany at the Botanic Garden, in Cambridge, attended by twenty-two students, fifteen of whom were ladies; the other in cryptogamic botany, at a seaside laboratory, Wood's Hole, Mass., attended by five students, two being ladies.

The summer school in geology was held at "Camp Harvard," Cumberland Gap, Kentucky, with thirty-one students selected from a large number of applicants. Prof. N. S. Shaler gives an extended account of this school in the January number of *The American Naturalist*. Next summer, in addition to a camp in Kentucky, there will probably be a subsidiary one among the mountains of North Carolina. The number of pupils will be limited to fifty. For further information concerning the plans for these courses we must refer our readers to the Catalogue.

A STRIKING THOUGHT. — The following is the closing paragraph of Principal Dawson's able review of Darwin's "Insectivorous Plants" in the January number of *The International Review*: —

"When he closes his long and elaborate investigation of Drosera with the words, 'We see how little has been made out in comparison with what remains unexplained and unknown,' we have an admonition to humility and patient inquiry which may well serve us as a closing thought. These words occur at the end of a tersely written record of experiments and observations extending over 270 pages. The whole of these experiments and observations relate to the structure and functions of a little leaf a quarter of an inch in diameter, and they are the work of one of the most accomplished naturalists of our time, extending over a period of fifteen years, and assisted by many specialists in the chemical and physiological questions involved. Yet the impression remains in the mind that, after all, little has been made out compared with what remains unexplained and unknown, even in relation to this almost inappreciable fragment of the great system of nature. There can surely be no plainer lesson than this, either to those who affect to believe any part of nature unworthy of God, or to see in the universe no evidence of design."

ATOMS.

A COMMITTEE has been formed at Florence for the purpose of celebrating, next May, the centenary of Cristofori, the inventor of the piano; the principal feature of the celebration will be international concerts on a large scale, and the Abbé Liszt has promised to play. — We are told that Galen in the decline of life suffered much from morbid wakefulness, until he had recourse to eating lettuce every evening, which cured him. — Saint-Claire Deville and Debray have succeeded in preparing platinum and iridium in a state of purity hitherto unattained; the platinum of a density of 21.5, and the iridium of the still greater density of 22.4. — A piece of wood cut from a tree is a good conductor; let it be heated and dried, it becomes an insulator; let it be baked to charcoal, it becomes a good conductor again; burn it to ashes, it becomes an insulator once more. — The *Scientific Press* of San Francisco inadvertently ascribes to the JOURNAL some remarks on the possible identity of the newly discovered gallium with indium, which appeared, if we remember right, in the *Manufacturer and Builder*. — Germany, with a population of 42,000,000, last year graduated 660 physicians, rejecting 180 applicants; in the same time the United States, with a population of 40,000,000, graduated 3000 physicians, and remorselessly turned them loose upon the community. — The *Technologist or Industrial Monthly* is one of the best journals of popular and practical science that we know of, and is wonderfully cheap on our "clubbing" terms, by which we are enabled to offer it *with the* JOURNAL for only $2.00. — Those who expect to "go to Rome," and those who don't, should read the detailed account of the "lions" of the city which Mr. Curtis Guild is giving in his interesting series of papers now appearing in the *Commercial Bulletin* under the title of "Abroad Again." — A recent Spanish medical journal thinks (and we will not venture to dispute it) that the tallest living specimen of the human race is a young man from Alcocer, twenty-six years of age, and 2.80 metres (9 feet 2.2 inches) in height, named Augustin Luengo Capilla, who has lately been presented to his Majesty the King of Spain. — The *Kindergarten Messenger*, the organ and advocate of the system, has been united with the *New England Journal of Education*, and its editor, Miss Elizabeth P. Peabody, is to conduct a Kindergarten department in the latter periodical, thus adding materially to the attractions it offers to teachers and friends of education. — After an exhaustive series of practical tests of the various disinfectants sold in New York, embracing over fifty kinds, Professor Waller, of Columbia College, concludes that the best disinfectant is carbolic acid, which should form about one per cent. of the mixture employed for the purpose. — That useful quarterly, *New Remedies*, published by W. Wood & Co., New York, is hereafter to appear as a monthly of 32 pages, at the reduced price of $1.50, or $1.00 to the subscribers of the *Medical Record*, which is on our "Clubbing List." — The *American Builder* (which we furnish *with the* JOURNAL at the subscription price of $3.00) begins the new year with an excellent number, containing, in addition to the usual variety of reading-matter, four full pages of plans of dwelling-houses and a sheet of working drawings for the same. — Those who wish to keep track of foreign periodical literature without a heavy expenditure of time or money should take either the *Eclectic*, which has just entered on its thirty-second year, or the *Living Age*, now in its 128th volume, both of which we furnish at regular subscription rates, adding the JOURNAL gratis. — Weber and Kohlrausch have calculated that if the positive electricity associated with one milligramme of hydrogen in water were diffused over a cloud, at a height of 1000 metres above the earth, it would exert upon an equal quantity of negative electricity at the earth's surface an attractive force of 2,268,000 kilogrammes.

LITERARY NOTES.

THE Appletons have published Mr. R. A. Proctor's *Our Place among Infinities*, "a series of essays contrasting our little abode in space and time with the infinities around us." It includes a dozen papers, among which are those on The Past and Future of the Earth, Seeming Wastes in Nature, New Theory of Life in Other Worlds, A Missing Comet (Biela's) and its Meteor Train, Star-Gauging, Saturn and the Sabbath of the Jews, and Astrology. The volume will be specially acceptable to American readers as containing in a permanent form much of the matter included in the author's lectures in this country during the present season. Those who were not so fortunate as to hear the lectures will find the book no bad substitute under the circumstances.

The same publishers reprint Darwin's *Climbing Plants*, which we mentioned some months ago as being in press in England. It is a revised and enlarged edition of an essay which appeared in 1865. The author says that he was "led to this subject by an interesting but short paper by Prof. Asa Gray on the movements of the tendrils of some cucurbitaceous plants." The book is not a large one (about 200 duodecimo pages), and will interest the general reader as well as the botanist.

An opportune issue of this centennial year is the *Familiar Letters of John Adams and his Wife*, edited with a memoir of her by Hon. Charles Francis Adams, and published by Hurd and Houghton. A portion of her letters were printed many years ago, and several editions have been exhausted. The call for a new edition suggested the addition of the corresponding letters of her husband, which was eminently a "happy thought." The double series is an important contribution to the history of the Revolutionary period, and particularly valuable and interesting for the glimpses it gives of the domestic life of the time. It can hardly fail to be one of the most popular books of the year.

The January number of the *United States Postal Guide* contains the usual matter thoroughly revised to date, with much fresh information — the new "rulings" of the department, for instance, which fill ten pages. Four closely printed pages, of four columns each, are devoted to the list of post-offices established, discontinued, or changed in name, from September 1st to December 1st. This fact alone illustrates the value of the book to all who have an extensive correspondence. It is issued quarterly, at $1.50 a year, by H. O. Houghton & Co.

The American Naturalist for January fulfils in all respects the promises of the new publishers at Riverside. The magazine is much improved externally and internally. The leading articles are of a more popular character, without losing anything of their scientific value. The "General Notes," which fill fifteen pages, give a good *résumé* of recent intelligence in botany, zoology, anthropology, geology, geography, and microscopy; and the reports of proceedings of societies and of contents of scientific serials will be found very useful for reference. It will be remembered that the magazine is on our "Clubbing List."

Messrs. Osgood & Co. publish *Geological Sketches, Second Series*, by the late Professor Agassiz, in style uniform with the First Series. The two volumes present in permanent form all the geological and glacial papers contributed by the author to the *Atlantic Monthly*. The present one contains the essays on the Glacial Period, on the Parallel Roads of Glen Roy in Scotland, on the Ice-Period in America, on Glacial Phenomena in Maine, and on the Physical History of the Valley of the Amazons.

Another "Second Series" from the same house is James Russell Lowell's *Among my Books*, containing papers on Dante, Spenser, Wordsworth, Milton, and Keats. That on Milton contains a severe criticism of Masson's notes on the peculiarities of the poet's English, and is worth far more than the price of the book to any student of Milton or of the English language.

A Farmer's Vacation (Osgood & Co.) is the title of the handsome volume in which Mr. Geo. E. Waring, Jr., of Ogden Farm, gathers up the interesting series of papers lately published in *Scribner's Monthly*, with some additional matter. They form a gallery of graphic sketches, with abundant pictorial illustration of scenery and life, especially farming life, in Holland, Normandy, and the Channel Islands. Dutch cheese-making is minutely described, and "the Jersey cow at home," and much beside of interest not only to the agriculturist but to the general reader. The book is printed in the best style of the University Press, and the illustrations show to even better effect than in the magazine. It may be found, with the other books noticed above, at Lockwood, Brooks, & Co.'s.

The American Architect and Building News is a new weekly "journal of constructive and decorative art," edited by Mr. W. P. P. Longfellow, and published by Osgood & Co. The general style of the paper is uniform with that of the well-known English architectural papers, and it is meant to cover, in America, substantially the same ground that they do in England. Each number will contain from eight to sixteen pages of letter-press, and at least four pages of plates executed by the heliotype process, and printed from stone. The journal has been adopted by the American Institute of Architects as its official organ. The subscription price is $7.50 a year, or $6.00, if paid in advance; and by a special arrangement with the publishers we are enabled to offer it *with the* JOURNAL at the latter very low rate. We commend it to all our readers who are interested in architecture or in art.

The Physician's Handbook for 1876, edited by Drs. W. and A. D. Elmer, and published by W. A. Townsend, New York, while it is all that could be desired as a pocket register and memorandum of practice, has the additional merit of containing more than a hundred compact pages of just the kind of information that it is convenient to have always at hand — an index of diseases, poisons and antidotes, incompatibles, weights and measures, signs and abbreviations, materia medica, new remedies, etc. Williams & Co. have it for sale, with all recent medical and scientific books.

The University Publishing Co. of New York have lately published Professor Gildersleeve's *Latin Primer*, *Latin Reader*, and *Latin Exercise-Book*, all marked by the same exact scholarship as his *Latin Grammar*, which we have before commended. There are no better books of their class, and very few as good.

The *International Review* begins the new year with a number of remarkable ability and brilliancy. It is now firmly established as one of the leading periodicals of its class on either side of the Atlantic. We furnish it *with the* JOURNAL at the regular subscription price, $5.00 a year.

Medicine and Pharmacy.

USE OF THE NASCENT CHLORIDE OF AMMONIUM IN TYPHOID PNEUMONITIS AND CAPILLARY BRONCHITIS.

BY E. CUTTER, M. D.

Sal-ammoniac is a very ancient remedy, and perhaps is more prized in Germany as an alterative, secernent, and absorbent medicine than in any other country. In chemical composition it is analogous to common salt, differing from it in the substitution of ammonium for sodium. It is well borne by the system and is not poisonous in the ordinary sense of the term. Of late, attention has been called to it as an excellent remedy in affections of the liver. Mild in its action, capable of being taken continuously for some time, and at the same time stimulating to increased hepatic action, it is deservedly worthy of esteem by the modern practitioner. For some years those engaged in the specialty of diseases of the throat have employed it as a stimulant to the chronically inflamed tissues of the pharynx and larynx. It has been administered, however, in an exceptional form, called nascent, that is, as it is first born or produced; and it is administered by inhalation only. The process of its production is very simple. Every student of medicine is familiar with the effect produced by bringing together the vapors of ammonia and muriatic acid. It has the appearance of smoke, but its physical and chemical qualities are far different. The chloride of ammonium is, as it were, born on the spot, and the crystals (for they prove to be such under the microscope) are so small and light as to float about freely in the atmosphere in the form of a light cloud of smoke. In this condition it is very easy to see how readily it can be inhaled and drawn into the lungs, and come into direct contact with the diseased surfaces. In fact, this method of administration becomes a topical application practically, by the diffusion of gases, and thus its topical effects may be produced as well as the systemic. The taste of the nascent NH_4Cl is very pleasant and agreeable when it is exactly neutralized. And just here lies the nice point of administration. There are a variety of physical combinations designed to produce this compound. Some of them may be found in the shops. Kirkwood's inhaler is the best of these forms of apparatus. The objection to most of them, lies in their expense. There are, however, means within the reach of the ordinary physician which are sufficiently efficacious and cheap. The writer has usually found a common large-mouthed pint or pound bottle — such as Dover's powder comes in — to answer the purpose of the reservoir. Two holes are perforated through the cork, one for a bent glass tube one fourth of an inch in diameter (a common clay pipe will answer, the bowl-end being used for breathing), and the other for a glass or tin or lead funnel. The use is very simple. An ounce or two of the acid is placed in the bottle, and the cork with tube and funnel is fitted into the neck of the bottle. A sponge moistened with ammonia is placed in the open mouth of the funnel, loosely, and the apparatus is complete. It is then used by drawing in the breath through the tube; immediately the vapor of the ammonia descends through the funnel, meets the vapor of the acid, and the whole reservoir is filled with a dense white cloud of nascent chloride of ammonium. The first effect is somewhat irritant; the saltish, sweetish taste is very prominent; cough is induced and some little excitement is occasioned. This, however, soon passes away if the neutralization of the acid is complete. When this is not the case, either an acrid, stimulating taste of the ammonia is perceived, or the raucous taste of the acid is prominent. When the ammonia is prominent more acid should be put in; when the acid is prominent the ammonia should be increased. It is best at first not to use the stronger preparation. The inhalation may be short (a few whiffs) and frequent, rather than long and infrequent. Three or four inhalations are sufficient at one time, and may be repeated half-hourly, or as the patient may desire, for there is no danger of administering too much, as very large doses of sal-ammoniac are borne with impunity. Affections indicated for this treatment are typhoid pneumonia, and capillary and senile bronchitis.

The following cases illustrating the treatment are selected from a large number: —

Case I. J. B., aged twenty-one, farmer, taken sick February 7, 1875. It was very cold winter weather in an unusually severe season. The patient had exposed himself by getting intoxicated and sleeping the night of this very February 7th on a hay-mow in a barn. He was severely chilled through, and on the 10th was found in bed in a third-story northerly room in a house against which a strong northwest wind, temperature below zero, blew fiercely. The temperature of the chamber was so low that water froze one half inch thick in a tumbler by the patient's bedside. There were no means of warming the room. The patient was very hot and feverish, temperature 104° (I think). Face red, countenance heavy; headache, dull and stupid. Sputa rusty, adhesive, copious, and were spat indifferently about on the bedclothes, the floor, or the wall, so that it was a difficult matter to approach him without unpleasant contact. He had diarrhœa also. Owing to the coldness of the room I could not examine his chest. I gave him veratrum viride, calomel, opium, and ipecac, water to drink, with beef-tea and stimulants. This case progressed from bad to worse. On Thursday, the 11th of February, there came on a thaw, with rain which lasted eight or ten hours. This lull in the weather afforded an opportunity to move him in a hack to another residence, where a fire and nursing could be procured. He bore the journey well and seemed improved. However, the next day the stomach became irritable, and he vomited nearly everything he took. He then contracted a sore throat, so that he could swallow only with the greatest difficulty, and then the stomach would reject the swallowed material. At the same time the diarrhœa troubled him. He had swelled and tympanitic bowels. He was delirous and comatose, but could be roused at times. He ceased to cough much and expectorate. Under these circumstances he was cut off from ordinary medication, and I resorted to the use of the nascent chloride of ammonium. A simple apparatus was devised, and the patient was roused and told to breathe it as much as he could. He seemed to like it, and inhaled it freely and faithfully. All other medication was suspended. The throat rapidly became better, but with the exception of tannin and camphor in opium for the diarrhœa, he took no medicine till he was convalescent, and on February 17th I ceased to attend him, as he had entirely recovered.

Typhoid pneumonia (or pneumonitis, rather) may be either (1) pneumonitis with enteric fever, or (2) pneumonitis of an asthenic or typhoid type. This case, with the tympanitis, diarrhœa, vomiting, general prostration, pulse varying from 120° to 140°, temperature 104°, delirium, coma, and sore throat, certainly seemed to present a very unpromising state of symptoms and prognosis. I don't say that the patient would not have got well, but I *do* say that he did get well under the action of the NH_4Cl when I and every one who saw him expected him to die, and I don't think that I ought to attribute no influence whatever to this medication, for by so doing I should do violence to my own common sense and judgment.

Case II. A youth of seventeen years had continued fever of a low type, during which, owing to the severity of the season and the relaxation of care on the part of the nurse, he contracted a severe bronchitis characterized by sonorous and crepitant râles throughout both lungs. There was vomiting, with considerable disinclination to take anything by swallowing. Under these circumstances the use of the nascent chloride of ammonium for a week or ten days was followed by a clearing up of the râles and a diminished amount of expectoration, with a recovery from the fever. About five months afterwards the same youth was ailing, not very sick; some cough, no fever, respiration a little hurried on exertion. At the upper third of left lung there was very marked dulness on percussion, with tubular respiration, showing a latent consolidation of the lung. This time the only medication employed was the nascent chloride of ammonium, under which a recovery was effected in about two weeks' time. In this case the inhalation was very agreeable and pleasant. I think the latent pneumonitis was shortened, as I have seen such a case very obstinate under ordinary treatment.

Case III. Another boy, twelve years of age, ill-fed, poor, pale, weakly moving about; pulse 110, respiration 32, coarse and sibilant râles all over both lungs, no dulness on percussion. Had been sick a short time. No effect was produced by iodide of potassium or expectorants and tonics, but the free and frequent inhalation of the nascent chloride of ammonium cleared the lungs of all the râles in about two weeks' time, and effected a permanent cure with no other means of medication. There was nothing peculiar about this case except the general weakness and debility of the patient. The effect of amelioration was quite prompt, although the thorough cure and drying up of the secretions progressed more slowly.

Case IV. A young married woman, with a child about two years old, had bronchitis, which had existed more or less for three months. There was no fever, but the râles were well marked all over both lungs. There was considerable wheezing, and labored respiration. Appetite almost nothing, pulse not much accelerated, respiration quickened. Larynx and throat healthy. She had faithfully tried the ordinary medicaments administered by the physicians who preceded me. At first I put her upon the inhalation of atomized iodine. This relieved her somewhat in a week's time. The râles and expectoration were less. One week of the NH_4Cl entirely cleared the lungs of all râles, so that I could not discover any abnormal sound, and this too while the general health was not improved; she was weaker, had no appetite, and tonics did not take hold. A few days after, I did hear in the left upper third front a few sonorously sibilant râles, but practically the disability was relieved. In this case the patient was disfigured by a large scrofulous mark on the cheek, and there appeared to be some systemic trouble impending to threaten life. As far as the exhibition and effects of the NH_4Cl were concerned no fault could be found, for it promptly did the work it was designed to do. Indeed, that it should do it under these circumstances is very much to its credit.

PEPSIN.

In his paper on the treatment of typhoid, elsewhere quoted in this number of the JOURNAL, Professor Thompson refers to the introduction of pepsin as marking "a real advance in therapeutics;" and this is an opinion in which undoubtedly all our best physicians are agreed. The increasing demand for the agent is sufficient proof that its value is coming to be appreciated by the profession generally.

The use of pepsin as an artificial solvent and adjuvant in digestion rests upon no subtle or doubtful theory. The subject is one which the non-professional reader, if he knows the alphabet of physiology, can understand. The gastric juice, as he is aware, is the fluid which does the work of digestion, so far as the stomach is concerned. Chemical analysis of this fluid shows that its indispensable ingredients are two: a neutral nitrogenous principle called pepsin, and an acid. Pepsin is a product of secretion, peculiar to the stomach, being found nowhere else in the system or out of it. About the acid there is nothing peculiar, and whether it is identical with hydrochloric or lactic, or both, or neither, is undecided and practically unimportant. The pepsin is the peculiar and essential principle in the gastric fluid, and by combining it with an acid we can make an artificial fluid which will dissolve food substances outside the stomach in the same manner as they are dissolved inside it.

Now in the therapeutical use of pepsin, we simply supply it to the stomach in cases where that organ, from any cause, fails to furnish it in proper quantity; and experience shows that, if its quality is unexceptionable, it answers the purpose perfectly. Dr. Attfield remarks that "as met with in pharmacy its strength varies greatly," and this is unfortunately true. The mode in which it is prepared is a matter of the highest importance. So far as we know, pepsin made according to the most approved methods has always given results satisfactory to the physician.

We may add that Messrs. Billings, Clapp, & Co. are now prepared to furnish pepsin of superior quality.

STRANGE THINGS IN ONE'S HEAD.

That men get queer things into their heads, figuratively speaking, is familiar enough; but that they should be able to live and retain their sanity with bullets and such like foreign material substances imbedded in their brains is not so common an experience, though instances of the kind are by no means rare. Our readers will recall the case of the New Jersey editor with the bullet in his head, and the *Clinical Record*, of St. Louis, relates the following equally curious history: —

A man named Waters, living near Leavenworth, Kansas, died from morphia a short time ago, and as it was known that he had had a habit of running wires and even nails through his own skull during his former residence in the penitentiary, a careful autopsy was performed. Two openings were found in the skull; one, which the prisoner was known to have made with a brad-awl, near the inferior posterior angle of the right parietal, and another near the superior posterior angle of the same bone. A wire was found in the brain. It had been introduced through the upper opening, and just missing the superior longitudinal sinus had pierced to the base of the brain a little in front of the fissure of Sylvius. It is stated that the corpus striatum was not wounded. A nail, one and three fourths inches in length, was found lying beside the wire. Although wires had been removed during life from the lower aperture, no trace of their course was discovered. Though the patient had shown a suicidal tendency, he did not appear insane, except for this habit, and could do his work with correctness and understanding.

The January number of the London *Doctor*, just at hand, adds the following instance, in which it would seem that the slate-pencil must have been in the brain long before the man became insane: —

At the post-mortem examination of a man who had been insane for a year — the result of an injury to the head (commotio cerebri) — a slate-pencil, three inches long, was found imbedded in the white substance at the base of the right posterior cerebral lobe. No further anatomical changes were observed; it could not be shown where the perforation of the skull had taken place, and the scalp and membranes of the brain presented no cicatrices.

M. Huppert, in the *Centralblatt*, gives the history of several cases in which foreign bodies have remained for many years in the brain without manifesting any symptoms of their presence.

MILK IN THE TREATMENT OF TYPHOID.

Professor W. H. Thompson, of the Medical Department of the University of New York, in a lecture on the treatment of typhoid, after referring to the use of beef-tea, which he thinks is "more often the plague of a sick-room than any other benevolent mischief that can be named," and to that of gruels, which, though better than beef-tea, are still a sort of "starvation" diet, proceeds to state what he would substitute for them, as follows: —

Far superior to either of these in its nutritive value and in its digestibility is that liquid prepared originally for the alimentary canal before it is old enough to dissolve any solid food, namely, milk. First, as to nutritive value, there is nothing absent from milk which the system needs, while in all our sick-room preparations there are invariably some deficiencies, and, generally, lackings of what is essential to continued life. The bones waste away remarkably in typhoid fever; what is there in beef-tea or gruel for them? The nervous tissue rapidly loses bulk also; where in these articles is there the fat which this more than any other tissue needs, except the utterly indigestible boiled fat of beef-tea, which turns into caustic butyric acid in the bowels? But milk has been aptly defined as fluid flesh and bones together; still better may we add, soluble nervous matter, for it is the nervous tissue which grows fastest and most at the age when milk alone is the diet. Now we are met by the objection that milk is a very indigestible article in fever, and among the laity we often find a positive dread of it, as if it were poison to the sick. I could never understand how physicians will aim by various measures to make milk digestible to infants who have to live on it; while in fever, if it seems to disagree, from a more than infantile weakness of the stomach, they are ready to abandon the only thing in the world which can be relied upon exclusively. If we dilute cow's milk, then add sugar and a little salt, and, lastly, cream, so as to make a child, starving because it cannot digest cow's milk pure, digest it when it is thus rendered more like human milk, why should we not try the same with a starving fever patient, rather than exchange this complete food for our confessedly incomplete and clumsy preparations? I can only say, in answer, that I have never yet met with a typhoid-fever patient who could not take milk, and not only live upon it alone, but also, in marked and impressive contrast with those cases which are fed on slops, be found at the termination of the disease with muscles and tissues still nourished enough to cause surprise even to the patient's friends. In order to make milk digestible you should remember that the chief difficulty in the way is its casein, and therefore you should aim to reduce its proportion by dilution with one half or one third of lime-water. The alkali in lime-water is a great assistant to the digestion of casein, for reasons too long for us here to explain, but, in addition, like salt, lime is both an antiseptic and an excellent agent for allaying irritability of the stomach and bowels. I have had patients take as much as six quarts in the twenty-four hours of milk and lime-water for days together, nor do I object to the mere bulk or amount of liquid which this implies, because I do not think that water is other than a need and a benefit to a fever patient, for it is the safest of all diuretics, and in this form I have never found it increase diarrhœa, but rather the opposite.

But you have still remaining a means for completing digestion, which experience leads me to rate as one of our best adjuvants in the task before us. The introduction of artificial solvents, such as pepsin and pancreatin, marks undoubtedly a real advance in therapeutics, but in no conditions does the employment of pepsin seem so much indicated as in the indigestion of fever. In fact, I have been surprised with some results from its use, which I was not looking for, namely, that it controls the typhoid diarrhœa better than any agent with which I am acquainted.

COUNTING THE BLOOD-GLOBULES.

At a recent meeting of the Medical Society of London, Dr. H. Lawson exhibited M. Hayem's novel method of counting the blood-globules, the apparatus used being from the manufactory of M. Nachet, the celebrated optician of Paris. It was shown, by actual examination of a specimen of blood, that there were about 4,455,250 red globules in the space of a cubic millimetre; that is, in a cube whose edge is a little less than .04 of an inch, and its bulk about .0006 of a cubic inch. We will describe as briefly as possible the mode of conducting the examination.

On the stage of the microscope was an ordinary plain glass slide, on which was cemented a piece of thicker glass whose central part was removed. This space was exactly one fifth of a millimetre in height, and, when a covering glass was placed on it, contained a quantity of liquid whose depth was precisely one fifth of a millimetre. Then in the eyepiece of the microscope was a micrometer which was divided into sixteen squares, which in the aggregate were equivalent to one fifth of a millimetre squared. This furnished a measure by which on looking down through the microscope one could estimate the number of red globules in the cubic fifth of a millimetre. But the globules, if the blood had been undiluted, would have been infinitely too numerous to be counted. Therefore by another instrument exactly two cubic millimetres of blood were taken from a wound; and then, by another somewhat like it, but larger in size, half a cubic centimetre, or 500 cubic millimetres, of serum (which had been obtained from a dropsical patient) was taken up and mixed with the blood thoroughly. This liquid was placed on the prepared slide till it filled it exactly, when the cover was placed upon it. On then look-

ing through the microscope it was quite easy to count the globules, which were found to be 142 in number. This multiplied by 125, to bring it to the cube, gave 17,750, which, multiplied by 251, or quarter of a centimetre plus 1, gave a total of 4,455,250. From this the number in a cubic inch can be readily calculated. It will be found to exceed *seven billions*, a number of which we can form no adequate conception.

GLEANINGS IN FOREIGN FIELDS.

Absorptive Power of the Skin. — A. von Wolkenstein has recently made some experiments on the skin of frogs, kittens, rabbits, and mice. He divided the skin at the upper part of the thigh, and then withdrew it over the toes; the sac thus formed was filled with distilled water and immersed in test-solutions of various salts. The results obtained were as follows: 1. The skin is permeable to watery solutions, but not to concentrated solutions. 2. Increased temperature augments the absorptive capacity of the skin; in fact, absorption stands in direct relation to the temperature of the fluid. 3. In young animals the skin absorbs better than in old ones. 4. The presence of hair and wool diminishes absorption. 5. Some alkaloids likewise undergo absorption through the skin, and toxic phenomena can be thus induced.

Curious Hypodermic Action of Glycerine. — According to Luchsinger the subcutaneous injection of a watery solution of glycerine into the areolar tissue is followed by an abundant discharge of the coloring-matter of the blood through the kidneys. The dissolution of the red corpuscles in the blood is always attended by the liberation of a ferment capable of transforming glycogen into sugar; but as Luchsinger could not discover sugar, while there was abundance of glycogen in the liver, he made further experiments, and discovered that glycerine subcutaneously injected undoubtedly possesses the power of checking, if not of preventing, the transformation of glycogen into sugar; hence the discovery may be of importance in connection with the treatment of zymotic diseases.

The Doctor in Siberia. — A foreign medical journal gives the following illustration of professional life in Siberia: —

In the course of ten months Dr. N. travelled, in his professional visits, over 5000 versts (about 3385 miles); the weather being sometimes so cold that even the spirits of wine froze in the thermometer. In travelling, he was obliged to carry provisions with him, for it was very often impossible to get any others. The warmest clothing is not always sufficient, and two of Dr. N.'s predecessors died of frost-bite in the lower limbs. At night, Dr. N. was obliged to rest in the *iurtas*, a kind of hut having the walls and roof covered with dung, which freezes and produces so great a lowering of temperature in the *iurta* that the air within is as cold as that without. Dr. N. has been unable to continue his nomad life, in consequence of the insufficiency of his pay. Besides attending to numerous patients, Dr. N. has published an excellent description of the medical topography of the country, and has described the pathogeny and symptoms of two endemic diseases.

A New Way of Getting a Medical Diploma. — Some Parisian rogues have contrived a way of getting a medical diploma of better character than the "Pennsylvania" ones which have been so extensively sold in Europe, and at even less expense than those cheap "sheepskins." Not long ago, as we learn from the *London Medical Times and Gazette*, an advertisement was inserted in several of the leading journals of France to the following effect: "1000 to 2000 francs lent to any doctor in medicine, or health officer, on the simple presentation of his diploma." As a consequence, several Parisian doctors — for the most part young men who had just taken their degrees, and whose practice was not equal to their wants — were entrapped by this tempting bait, and hastened to the address given. They were most politely received, and asked to leave their diplomas for verification by the gentleman who was so willing to make the loan, one week being required for this purpose. It is almost needless to say that on revisiting the house at the end of the period specified, the victims found that the money-lender and their papers had disappeared together; and doubtless the original entries on these documents have been carefully erased, to be replaced by the names of impudent quacks, who will thus appear to be practicing as regular licentiates of the Sorbonne. Up to the last accounts the concocters of this cleverly devised but nefarious plot had not been detected.

Milk Diet in Diabetes. — Dr. Donkin, in the *British Medical Journal*, contends that milk sugar differs so essentially from cane sugar, grape sugar, and pure diabetic sugar, that it is not converted into them, and does not appear again in form in the urine. Belonging to a different class of sugars, milk sugar does not undergo alcoholic fermentation in contact with yeast, and in addition, it does not precipitate the oxide of copper when treated with the reduction test. On the other hand, it is subject to lactic fermentation by the action of ferments. On account of these intrinsic differences, lactose, as an ingredient of milk, cannot undergo the same metamorphic changes as glucose in the processes of digestion and assimilation in health (nor be converted into it in diabetes), its conversion into lactic acid being direct and immediate, not by the intermediate changes through which glucose passes into this substance. For this reason, which is perfectly intelligible, milk sugar, unlike vegetable glucose, is assimilated, and the reverse of injurious in diabetes. To give skim-milk a fair trial, no other food must be allowed to mix with it in the stomach. If it cannot be made the exclusive diet, care must be taken that the milk be entirely absorbed before other food be swallowed.

Treatment of Eczema in Children. — Dr. Calpari in the *Bulletin de Thérapeutique*, as quoted in *The Doctor*, extols the effect of lime-water in curing eczema of the head and empetigo of the face in children, especially chronic cases which have resisted other treatment, and states that a marked improvement is noticeable after using it for eight days. He recommends to take it in quantities varying up to half a pint, according to the age of the patient, and to dust the part with carbonate of magnesia; but the latter he considers necessary only when the secretion is very irritant.

SELECT FORMULÆ.

Jelly Water. — This is excellent for fever patients or those suffering from summer complaint:

One large teaspoonful of wild cherry or blackberry jelly;
One goblet of ice-water.

Beat up well.

Salicylic Acid in Otorrhœa. — Dr. Curtis Smith, in the *Detroit Medical Review*, recommends the following in otorrhœa: —

Acidi salicylici	ʒ j.
Magnesiæ carb.	ʒ ij.

Powder very finely and mix.

After cleaning the ear thoroughly with cotton and a fine probe, he introduces a little of this into a small gum tube and blows it into the ear, being careful to have it deposited on the diseased portion. He relates some striking cases cured by this plan, which is simple, and can be easily carried out by any one. It is always necessary to have the diseased surface thoroughly cleaned of all discharge before blowing the powder into the ear. Dr. Chisolm had previously recommended salicylic acid in the *Medical and Surgical Reporter*.

Gouland's Lotion. — This preparation is much used in England as a cosmetic, for sunburn, freckles, tan, and eczema. It is made as follows:

Bitter almonds	3 oz.
Distilled water	16 oz.
Corrosive sublimate	1½ grs.
Sal ammoniac	2 dr.
Alcohol	4 dr.
Cherry laurel water	4 dr.

Blanch the almonds and grind them with the water, and pass through a cloth. Dissolve the salts in the cherry laurel water and alcohol. Mix the two solutions.

IODOFORM.

This therapeutic agent possesses in a wonderful degree the power of reducing inflammation, soothing pain, and rapidly healing excoriated and ulcerated surfaces, by whatever cause produced. As a topical application its healing and anæsthetic powers are unequalled by those of any known agent. I am daily using it in the form of suppositories in cases of acute vaginitis with almost magical effect, and even in inflammation and induration of the neck of the womb it has proved itself an invaluable agent in rapidly relieving pain, reducing inflammation, and softening and restoring indurated tissue to a normal condition.

I am also successfully using iodoform, in ointment form (forty grs. to one ounce ung. simplex), in painful glandular enlargements. It has, in my own practice, shown itself as efficient as iodine. In connection with the topical application of this agent I daily administer three one-grain pills, at intervals of four hours each. For all such ills as these, iodoform has accomplished much already, and is destined, as I believe, to be of greater benefit, in the hands of the physician, than any known remedy.

J. H. Johnson, M. D.

Providence, R. I.

FACETLÆ.

A Queer Case. — Dr. John Case was a noted quack and astrologist who flourished in London in the time of Queen Anne. He took the house where William Lilly, the famous astrologist, had resided, and over the door he placed the following distich, by which he is said to have made more money than Dryden by all his poetry: —

"Within this place
Lives Dr. Case."

Upon his pill-boxes were these lines: —

"Here 's fourteen pills for thirteenpence;
Enough, in any man's own consci-ence."

A Doctor's Epitaph. — The *London Medical Times and Gazette* says that the epitaph on Dr. Thomas Crossfield, in Hendon churchyard, Middlesex (written by himself), is as follows: —

"Beneath this stone Tom Crossfield lies,
Who cares not now who laughs or cries.
He laugh'd when sober, and when mellow
Was a harum-scarum, heedless fellow.
He gave to none design'd offence,
So 'Honi soit qui mal y pense.'"

BACK NUMBERS WANTED.

Numbers 1, 2, 3, and 4 of Vol. VII., dated July, August, September, and October, 1872, of Boston Journal of Chemistry. Must be in good order. Address, giving price, David E. Mishler, Mogadore, Summit Co., Ohio.

TO PHYSICIANS.

For Sale. — Medical Office. Well located, old established, nicely furnished, and doing a first-rate business. Earnings in 1875, $5000. No bonus required. Tip-top opening for any one. Reason for selling, other business. For particulars, address
Toledo, Ohio. Dr. J. B. WILFORD.

WANTED. — A permanent engagement by a single man, age 26; has had ten years' practical experience as prescription clerk. Unexceptional references. Salary moderate, and not afraid of work. Address P. O. Box 143, Auburn, N. Y.

Rooster Brazilian, a perfect stomachic, advertised in our columns, is an elegant concentrated Bitter. Thomas G. Gerrish, the proprietor, has brought it to perfection at great expense, and should receive the patronage of all lovers of a perfect Stomach Bitter.

Boston Journal of Chemistry.

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Familiar Science.

THE WONDERS OF MODERN ENGINEERING.

THIS is the age of stupendous engineering enterprises. The Pyramids of Egypt were marvels of labor in their day, and still excite our wonder as examples of what immense numbers of workmen could accomplish with comparatively rude mechanical appliances. But the great engineering works of our time are remarkable rather as illustrations of what can be done by ingenious and powerful machinery, with very moderate use of manual labor. They are the results of scientific skill rather than of brute force. They are also remarkable in many cases for the delicacy and precision of the mathematical and instrumental work necessary in laying them out and carrying them through. The ancient Egyptians might possibly have bored a five-mile tunnel through a mountain, but they could hardly have begun the work on opposite sides and "made both ends meet" without the variation of an inch, as engineers have done in our day.

These great tunnels, by the bye, are among the grandest achievements of our modern engineering. Saying nothing of our Hoosac "bore" (which, if not the biggest, we can boast of as one of the costliest in the world), the Mont Cenis is thrown into the shade by the Saint Gothard, now progressing rapidly; and the latter is destined to be surpassed, not only in extent but in the peculiar difficulties of the undertaking, by the proposed tunnel from England to France, which is now quite certain to be constructed. It will certainly be attempted, and once begun its completion is simply a question of time and money. Modern science, backed by modern capital, will not allow itself to be baffled in such an enterprise after it has made up its mind that it is feasible.

We will not dwell upon such familiar triumphs of Yankee engineering as our trans-continental railway (finished less than forty years after the project of a railway from Boston to Albany, only two hundred miles long, had been pronounced Quixotic by wise men of the former city), or our great bridges, like the one in process of erection between New York and Brooklyn, which are unrivalled in Europe, not only in magnitude but as examples of constructive skill. We are not now celebrating our own "Centennial" glories, and shall continue to look across the Atlantic for illustrations of our subject, selecting there only one or two of the latest and least familiar.

The venerable pleasantry about the "Dutch taking Holland" is no joke at all from one point of view. The patient dwellers in "Hollow-land" have for centuries been waging war with the ocean for the possession of their native soil. At times they have lost large portions of it, which the watery foe has overrun; and again by persistent effort they have succeeded in retaking parts of the invaded territory. In the JOURNAL for March, 1875, we gave a brief account of one of these prolonged contests with the sea, by which Haarlem Lake, lost in the sixteenth century, was won back in the nineteenth, after an engineering campaign of thirteen years. About seventy square miles of Holland were taken by the Dutch in that war, and so well fortified against the enemy that he will not be likely to get control of it again. And now they meditate an attempt to recapture a larger portion of their ancient heritage, lost even longer ago. On the 1st of November, 1170 (if the date can be depended upon), the ocean made a sudden and fierce attack on the sandy barriers in the northern part of Holland, carried them (literally) by storm, and occupied the great district which has since been known as the Zuider Zee. By that briny incursion the Dutch were driven out, or drowned out, of more than a thousand square miles of their country. This, or the better part of it, they now propose to recover. It is a tenfold greater enterprise than the draining of Haarlem Lake, but competent engineers say that it is feasible, and though it will require a vast outlay, this will doubtless be reimbursed, as in the former case, by the sale of the lands.

For another example of the audacity, so to speak, of modern engineering projects, we turn from Holland to England again. There, instead of driving out the ocean from the interior of the country, they are planning to bring its waters more than thirty miles inland, and to convert a city at that distance from the coast into a seaport. Manchester, the great cotton metropolis, is situated on the Irwell, a little stream flowing into the Mersey, so insignificant that many of our readers may never have heard of it, and so dirty (unless it has been improved since we last saw it) that it seems more like an open sewer than anything else. This filthy and sluggish stream it is proposed to deepen and widen from Manchester to the Mersey, and to continue the work on the latter river down to Liverpool. A tidal channel to the sea will thus be formed, 33 miles in length, 200 feet wide, and with a minimum depth of 22 feet. The ships are to be taken up by means of steam tugs, in the same way as they are drawn through the Suez Canal. The total cost of the enterprise is estimated at £3,500,000, or $17,500,000, which is considered no extravagant price for the advantages that may be expected to accrue to Manchester.

The "cotton lords" of that wealthy city could well afford to furnish the capital for this enterprise, even if they were to receive no direct return in the way of dividends; but it is probable that simply as an investment it will prove very profitable. A somewhat similar work has been carried out on the Clyde, by which large ships are enabled to come up to Glasgow, whither in former times only vessels of forty tons could ply. The wharves of that city now extend more than three miles along the river, and the harbor dues bring in a clear income to the corporation of at least £150,000 ($750,000) a year, after providing for dredging and all other expenses. In 1801 the population of Glasgow was only 83,000; now it is more than half a million, and the improvement of its communication with the sea has been an important factor in the increase. Sixty years ago the depth of the river at high water was only 5 feet; in 1820 it was 9 feet; now it is 22 feet, and Glasgow in commercial importance is the third city in Great Britain. The two millions sterling ($10,000,000) sunk in the Clyde has been, directly and indirectly, the best investment the "canny Scots" of old St. Mungo's town ever made. The Manchester people have, therefore, a most encouraging precedent for the plan of converting their inland city into a seaport. What has been done on the Clyde may be done on the Irwell, and with as fair a prospect of profit to all concerned.

THE HYGIENE OF THE PRINTED PAGE.

NEARLY a year ago, a writer in the *Boston Medical and Surgical Journal* raised the question, "Should printed lines be short?" The following extract gives the gist of the article: —

"If the New York *Times* or *Tribune*, the Boston *Post* or *Advertiser*, should widen its columns to the length of ten or fifteen inches, it would, in a short time, lose all its readers. If you undertake to read a page of the *North American Review*, and then one of *Littell's Living Age*, you will find the latter much the easier reading. Or, to make the comparison more effectual, suppose you read a page of one of the English reviews and then a page of the same article in the American review, the former having lines of five or six inches in length, the latter not much more than half as long. Or consider more particularly the great difficulty in reading legal documents, insurance policies, gubernatorial proclamations, college diplomas, and the like, the lines of

which may be twelve inches, twenty inches, or two feet long; no one reads such papers if he can help it.

"And the reason is the necessity of moving the head on its axis, to turn the eyes from the left to the right, and *vice versâ;* but still more, and what is a vastly greater evil, the constant demand on the eye to change its focus in order to accord with the varying distance from the eye to the extremes and the middle of the line. Some persons would perhaps deny that any such inconvenience is experienced. These persons have probably considered very carelessly their own sensations, and make very little allowance for those of others. Such persons, too, have very likely paid little attention to the reason why some print is less attractive than other print."

Another reason, in our opinion, why both written and printed lines should be short is the difficulty of "keeping one's place" in going from line to line when they are long. On this account, an epistle written on note-paper is easier to read than one on letter-paper, and this may partially explain why the former size has become more popular. It is also one reason, if not the chief reason, why "leaded" print is more easily read than "solid" matter in the same size of type. A near-sighted person feels this difficulty more than one does whose vision is normal; though the latter will, we think, be conscious of it when reading under unfavorable circumstances, as in a railroad train, or with imperfect light.

There is also a relation between the size of the page and the ease and comfort with which we read it. Other things being equal, a small page is better than a large one, especially in a book. The large pages of newspapers can be folded so as to bring a limited space before the eye at once, but we cannot do this in the case of a bound volume. It is an inconvenience to have to do it with the newspaper, and this may be one reason for the growing popularity of the "quarto" form. If a journal is to be bound up, it ought not to have a page larger than the one now before the reader. Larger pages may be required for some of the illustrated journals, but a bound volume of such a periodical, though one may enjoy looking at the pictures, is fearfully hard reading, especially for those who are at all near-sighted.

The chief advantage of the small page is that it may be easily held at the most comfortable angle before the eye. The big book, too heavy and clumsy for the hand, must lie on the desk or table, and unless the type is of liberal size one must bend or stoop over it, in order to read the greater part of the page. To the severe strain upon the eye are added all the evils of a cramped and unnatural posture of the body. The volume may be supported by a book-rest, but this is at best merely a mitigation of the evil. Such a contrivance, however, ought to be used to a greater extent than it is, especially in our schools, and by students generally. Much of the unhealthy bending over desks might be obviated by the use of some simple and cheap support for the quarto geographies and other large-paged books of the common school, and the lexicons and atlases of a more advanced course of study.

Dictionaries are almost invariably the worst of books, from our present point of view. The page is large, the type is small, the book is heavy. This is inevitable, perhaps, on account of the necessity of crowding so much matter into a single volume. To put it in several volumes would not only add greatly to its cost, but also make it less convenient for its purpose. There might, however, be an improvement in the abridged dictionaries used in elementary work. For ordinary high-school use, for instance, why should we not have English, French, and Latin dictionaries in large, clear type? The volume would have to be somewhat larger, but need not be unreasonably bulky, and the gain in size of type would more than balance the loss in ease of handling.

We may remark here that the "vocabularies" appended to many of the school editions of the classics seem to us particularly objectionable, on account of being in type much finer than the body of the book. The pupil in learning his lesson is continually turning from one size of type to the other, now looking at a word in the text, and now at its meaning in the vocabulary, and the strain upon the eye in accommodating itself to the two kinds of type is very great. Let any one place before himself two pages of large and small type, and turn rapidly from one to the other, reading a line or sentence of each, and he will get an idea of this optical strain. It would be better to use larger type in the vocabularies, even if twice as many pages were required for it; but in many cases space might be saved by omitting superfluous definitions.

For ordinary reading, as we have said, the small book that can be held in the hand without weariness is better than the big and heavy one; and the problem for printers and publishers is to furnish good, legible type in this "handy" form. That the problem can be solved, and in a tasteful and attractive manner, is shown by the "Little Classics" lately brought out in Boston, which seem to us quite faultless from a hygienic point of view; and to this fact their immediate and marked popularity is probably in no small degree to be ascribed. The new edition of Hawthorne, in the same style, is having as good a "run," and we believe this is mainly due to its form. We hope to see similar editions of all our standard authors, especially those which have hitherto been accessible only in clumsy duodecimos or clumsier octavos. There are books enough that must inevitably be bulky and heavy; let us have small and handy ones when it is possible.

The binding of a book is a matter that comes partially within the scope of our subject. We object, on hygienic grounds, to that close, tight binding which makes it impossible to lay the page flat before the eye. Reading on a curved surface tires the eye, which must accommodate itself to the varying distances of different parts of the line. It is a common mistake also to make the inside margin of the page too narrow, so that if the volume is tightly bound it requires a special effort to see the inner end of the lines.

We have by no means exhausted the subject, and may resume it hereafter.

DOWN CELLAR.

MAN, at least in his present stage of progress, can hardly be considered a burrowing animal, and the more he lives above ground the better, doubtless, for his health. He cannot live always out-of-doors, perhaps, and in building his domicile his first care should be to have it high and dry. To do this necessitates first the judicious choice of a site, and next the proper use of it. The man who "founded his house upon the sand" doubtless dug a cellar, and depended on it to his cost, while he who "built upon a rock" had a high, airy basement, and lived happily.

The old-fashioned, deep, dark cellar, with its steep stairs, its slimy walls, and its annual spring freshets, always seemed a fitting place for foul, dark deeds, and a good nursery for potato sprouts, fungi, and germs of typhoid fever. The rickety, thin-walled, breezy, out-of-ground basement of the modern "built-to-sell house" is better, but a proper medium between the two is better still.

A cellar which finishes eight feet and a half in the clear is high enough for an ordinary house, and for this height put the floor four feet below the original surface of the ground, and bank or grade the walls two feet higher outside. This will leave two feet and a half of wall to show as underpinning. The walls should be started from broad flat footings of stone, or projecting courses of brick, or concrete of cement and gravel. They should rest on firm and solid ground, at least six inches below the cellar floor, and always below the deepest frost (reckoning from the level of new grade outside). The frost last winter penetrated to five feet in depth in exposed situations, and many foundations ordinarily considered safe were disturbed by it. An even, dry, gravel soil is the best, both for a foundation and for health. Clay soils are treacherous, and have a deservedly bad reputation.

If ledge stone are available they may be used to advantage, but they should be of good sizes with flat surfaces, and should be laid with snug joints, well bonded and tied together, and most of the stone should go clear through the thickness of the wall. The whole work should be laid and pointed with cement and lime mortar mixed together in equal proportions. Walls in very dry situations may be laid without mortar, the joints being pointed or filled with mortar after the stone is laid. Very durable cellar walls may be built of good hard-burned brick, laid in cement or cement and mortar. They should have footings of flat stones or of brick-work, and should be built vaulted, that is, with an air space between the outer and inner courses. For an ordinary wooden house a wall should be made up of two courses solid (about eight inches) outside, an air space of two inches, and an inside wall of one course (or four inches); the inner and outer walls being connected and tied together across the air space at frequent intervals by brick headers. This kind of wall has many advantages, as it keeps a cellar warm in winter, and is not easily penetrated by water. Where stone is used below ground, the vaulted brick wall makes an excellent "underpinning" above ground.

If a house is located on a wet soil, special means must be employed to keep the cellar dry. A trench dug around the outside, as low as the footings, filled with loose stone, and extended by a pipe drain to lower ground, will in many cases prove effective. Or a trench may be dug around the cellar inside and filled in the same way, with an outlet under the wall at its lowest corner, for the water to run off. These are called "blind drains," and are built of various sizes according to circumstances, but should scarcely ever be less than a foot by eighteen inches in section. These channels are simply to

carry off water from the ground, and keep the floor and walls dry, and of course are never to be used for any other purpose. If the floor of a cellar is unusually wet and spongy, it may be necessary to cover its whole surface with coarse gravel or broken stone, or other dry, porous rubbish through which water may pass freely, and to make frequent outlets under the walls with drain pipe, which should be connected with proper drains outside.

Whatever the nature of the ground in which a cellar is dug, the whole floor should be made proof against the passage of dampness. This may be done by covering it with concrete three inches or more in thickness. The concrete should be made of cement and clean gravel, mixed in the proportion of one of the former to five of the latter, and the whole be well smoothed over with cement and sand. Or some of the asphaltum or coal tar concretes may be used, though these are more or less objectionable on account of their disagreeable odor. Brick laid and "grouted" (washed over) with cement mortar makes a good but more expensive floor. Previous to any covering being put down, the earth should be well levelled and rammed to furnish a solid bed for the concrete or paving.

A cellar should be well lighted in every part by windows, and besides the natural ventilation which can be had by opening these occasionally, there should be, if possible, one or more openings into warm flues in the chimney stack, so that the air may be continually changing.

No regular drains for sewage should ever be laid under a cellar floor. No matter what precautions are taken, there is always a chance that some leakage may sooner or later occur, and when it happens it may go on for a long time, filling the earth with offensive and unhealthy deposits, until the inmates of the house are seriously affected. Drains are put out of sight, and frequently their location is forgotten. In changes which often take place, some of them may be abandoned or partially closed. These old drains furnish harborage for rats, and various kinds of decomposing matter are collected in them. In time the cellar flooring may crack or settle, and putrid gases rise into the house. Thus what should be a clean and healthy foundation for the whole structure becomes a dangerous nuisance. There is but one simple and effective remedy, and that is to start the drain pipes at the outer wall, and hang all the waste pipes from the cellar ceiling in plain sight, and where the slightest leakage can be at once detected. These pipes had best be of iron, and in any ordinary building can be arranged to have a sufficient pitch towards the drain, without coming below the cellar ceiling enough to interfere with headway, and at the wall can be carried down perpendicularly into the mouth of the drain pipe, where the junction should be made tight with cement, and should be in plain sight. The best kind of drain pipes are of "glazed stone ware" with socket joints, and they should be laid in a bed of cement, and the joints made tight with the same. For common drains a pitch or fall of one half-inch in a foot is sufficient.

If every man who builds would remember that everything which commonly goes under the name of sewage is dangerous to the health of his household, and should be removed as quickly and to as great a distance from his home as circumstances will permit, he will, of course, so build as to render this removal prompt and effectual. J. A. F.

HINTS FOR EXPERIMENTS.

Artificial Snow Crystals. — In an article on Snow which appeared in the Journal some months ago, we referred to the many beautiful forms which the crystals assume. They have been the subject of much study from the time when Scoresby, the Arctic navigator, first classified them according to their principal types, down to our own day, when more than one elegant book has been devoted to the illustration of their varied loveliness. They are, however, as perishable as they are exquisite, and the difficulty of observing them except in a freezing air has led M. Dogiel, of the St. Petersburg Academy, to seek for some substance not liable to dissolve at ordinary temperatures, and crystallizing, like snow, in the hexagonal system. He selected iodoform (CHI_3), a compound familiar to some of our readers from its medicinal uses. It crystallizes in a remarkable variety of forms. To show their multiplicity M. Dogiel dissolves iodoform in boiling (90 per cent.) alcohol, and lets the solution cool in water of different temperatures. He gets mostly tabular crystals, when a solution containing 15 to 30 per cent. of iodoform is kept ten minutes in water of about 14° to 15° C.; whereas star-shaped and often very complicated crystals are had at temperatures of 26° to 37°. Some other modifications of the result are described by M. Dogiel in a paper recently published, and he also gives drawings of the crystals he obtained. We presume that some of our readers may be interested to repeat his experiments.

An Interesting Experiment. — There are some substances — arsenic, for example — which under ordinary atmospheric pressure pass from the solid to the gaseous state without first fusing; whereas, with increased pressure, they can be fused. A good lecture experiment for showing that the phenomenon depends on pressure has been described by M. Meyer, to the Berlin Chemical Society. Into two similar tubes, with one end open, are introduced a few grammes of iodine. The upper open ends are drawn out, the air is removed from one of the tubes, while that in the other is gently heated; then both are closed by fusing. The iodine in the two tubes is now heated with a Bunsen burner. In the air-containing tube the iodine fuses, while a colored almost opaque vapor is given off, and on turning up the tube the fused iodine runs down and solidifies again on the cold sides. In the vacuous tube, on the other hand, the iodine does not fuse, but is at once vaporized, and a vapor cushion is formed between the crystals and the glass, as in Leidenfrost's phenomenon. The vapor is but little colored and quite transparent; because, air being absent, it rises at once to the cold parts of the tube and forms a ring of sublimated iodine.

Preparation of Phosphene, or Phosphoretted Hydrogen. — Mr. F. L. Harvey, of the Arkansas Industrial University, Fayetteville, Ark., sends us the following: "Eliot and Storer's Manual of Chemistry gives instructions to burn phosphene (PH_3) in oxygen, by collecting a portion of the former in a small bottle, and pouring it, one bubble at a time, into a larger bottle partly filled with the latter, inverted upon a shelf of the water-pan. I have tried the experiment several times, and although it succeeds very well, I find that a great many of the bubbles will not take fire on entering the oxygen, making the author's precaution against allowing too much of the gas to enter (lest an explosive compound be formed) well timed. I find by experiment that I get better results by allowing the phosphene, slowly generating, to pass from the end of the delivery tube directly into the bottle partly filled with oxygen and inverted in the water-pan. This method is certainly more simple, and the generation regulates the flow of the bubbles, making the experiment more satisfactory."

FAMILIAR SCIENCE NOTES.

Recent African Discovery. — At a January meeting of the Geographical Society in London, a paper was read giving the results of Lieutenant Cameron's journey across tropical Africa; and they are highly important. Although unable to follow the outflow of Lake Tanganyika, his observations leave no doubt that it drains into the Congo, and not the Nile, as was believed by Livingstone. The distance traversed by Lieutenant Cameron includes a route of twelve hundred miles, over altogether new ground; and what is of great importance, he has registered, with much accuracy, an extraordinary number of lunar observations, laying down a sound geographical basis for the further exploration of the continent. The southern tropical portion of Africa is much healthier and also richer than the northern. It is probable that if properly worked the country between the central lakes and the Atlantic would prove the most productive in the world. "The interior," says Lieutenant Cameron, "is mostly a magnificent and healthy country of unspeakable richness. I have a small specimen of good coal; other minerals, such as gold, copper, iron, and silver are abundant, and I am confident that with a wise and liberal expenditure of capital one of the greatest systems of inland navigation in the world might be utilized, and in from thirty to thirty-six months begin to repay any enterprising capitalists that might take the matter in hand." He thinks that with a capital of from one to two millions Central Africa might be thrown open to trade in about three years.

Facts about Explosives. — According to League and Champion the priming powder for Chassepot guns explodes at 191° C., fulminate of mercury at 200° C., gun-cotton at 220° C., gunpowder at 295° C., picrate powder for torpedoes at 315° C., picric acid at 336° C., and picrate gunpowder at 380° C. Before a detonating substance can explode, a certain mechanical excitement is necessary. Iodide of nitrogen placed at one end of a tube seven metres long was caused to explode when an explosion was produced at the other end of the tube. Some iodide placed on the strings of a contrabasso was found not to explode on bowing the two lower strings; while that placed on the string giving the highest note exploded. It was further proved that heat, unless accompanied by mechanical agitation, does not readily produce explosion. In Professor Abel's experiments the velocity of transmission of detonation was determined by means of an electric chronograph, and in the case of compressed gun-cotton was found to vary between 17,000 and 20,000 feet per second, while in the case of nitro-glycerine it was only 5500 feet per second. Dr. Sprengel finds that porous cakes of chlorate of potassium saturated with bisulphide of carbon are five times as effective in open granite quarries as an equal weight of gunpowder.

Comfort for the Small-Headed. — It is well known that persons are sometimes found with peculiarly small heads and a very low type of mental development, so that they greatly interest anthropologists. Carl Vogt propounded the theory that these "microcephalic" persons are cases of "atavism" (as it is called), showing the partial recurrence of an ancestral ape-type; the cranium of an ape being combined with the prognathous countenance of a man. Opposing this view, Sander sought to show, from an examination of two microcephalic brains, that these had no similarity to the brains of an ape, but that they were simply imperfect developments of human brain. The subject has been gone into very thoroughly by Aebz, who has

made careful measurements of a great number of microcephalic brains and skulls, comparing them with the higher forms of apes. The result he arrives at is also that Vogt's attempted identification of the microcephalic and ape crania must be rejected.

New Classification of Bodies. — M. Mendeleeff, a Russian chemist, classifies all known bodies, elementary and compound, by an arrangement of vertical and horizontal lines, according to the likeness or dissimilarity of these bodies and the numerical value of their characteristic elements. He thus makes a double table in which all known bodies are arranged, so that it is possible to pass from one to another by the multiplication of one factor by another. Remarking that a large number of gaps occur in this table, he thinks it probable that they correspond to bodies unknown at present, the existence of which will one day be discovered. According to the relative position of these gaps he is able to show beforehand their properties and characteristic numbers (equivalent weight, density, etc.). If, for example, this table had been made before the discovery of bromine, the place of the latter could have been anticipated between chlorine and iodine, and its properties pre-indicated. The newly-discovered metal, gallium, occupies a space which was blank in Mendeleeff's table, corresponding to a body which its author would have named by hypothesis hexaluminium, with a density of 5.9.

Restoration of Faded Ink. — It often happens that the ink with which old records were written, upon either paper or parchment, has faded and rendered the characters entirely undecipherable. It is well, therefore, to know that such writings may easily be rendered legible by moistening the paper with water and then passing over the lines in writing a brush which has been dipped in a solution of sulphide of ammonium. The writing will immediately appear quite dark in color, and this color, in the case of parchment, it will preserve. Records which were treated in this way in the Germanic Museum in Nuremberg ten years ago are still in the same condition as immediately after the application of the process. On paper, however, the color gradually fades again; but it may be restored at pleasure by the application of the sulphide. The explanation of the action of this substance is very simple. The iron which enters into the composition of the ink is transformed by the reaction into the black sulphide.

An Anecdote of Sir Isaac Newton. — The house which Newton occupied, on the south side of Leicester Square, in London, is still standing, and his observatory is shown to visitors. When he took up his residence there, his next-door neighbor was a widow lady, who was much puzzled by the little she had observed of the philosopher. One of the Fellows of the Royal Society of London called upon her one day, when, among other domestic news, she mentioned that some one had come to reside in the adjoining house who, she felt certain, was a poor crazy gentleman, "because," she continued, "he diverts himself in the oddest ways imaginable. Every morning, when the sun shines so brightly that we are obliged to draw the window blinds, he takes his seat in front of a tub of soapsuds, and occupies himself for hours blowing soap-bubbles through a common clay pipe, and intently watches them till they burst. He is doubtless now at his favorite amusement," she added; "do come and look at him."

The gentleman smiled, and then went up-stairs, when, after looking through the window into the adjoining yard, he turned round and said: "My dear madam, the person whom you suppose to be a poor lunatic is no other than the great Sir Isaac Newton, studying the refraction of light upon thin plates, a phenomenon which is beautifully exhibited upon the surface of a common soap-bubble."

Practical Chemistry and the Arts.

BROTHER JONATHAN SENDING FRESH BEEF TO JOHN BULL.

It would be curious if the "roast beef of old England" should come to be largely supplied from Brother Jonathan's farm across the seas. The success of a recent experiment has been such as to render this result not improbable. We have sent John Bull a sample of our beef, kept fresh and sweet by a refrigerating process during the ocean transit, and he is pleased with it, and, like Oliver Twist, is asking for more. Compartments have been fitted up in the hold of several of the Guion line of steamers, running from New York to Liverpool, each capable of storing 200 tons of meat. The cattle intended for shipment are killed a day or two before the vessel starts, great care being taken to extract all the blood. After the carcass is cut up, the quarters are sewn up in canvas and conveyed to the steamers. Here the bags of meat are slung so as to swing clear and allow of a free passage of air all round them. Tanks round the compartment are filled with ice sufficient to keep the temperature down to 37° during the passage, and constant motion and circulation of the air are maintained by the action of a large fan worked by steam. The effect of keeping meat in this dry, cold atmosphere for ten or twelve days is so to harden and solidify the surface that at the end of the passage it is more marketable in appearance than when first killed.

The London *Standard* says of the first lot of this beef received in the metropolis: —

"Some forty tons were forwarded by special train direct from Liverpool to the Central Meat Market at Smithfield, and found a ready sale at top prices. All the meat has reached market in splendid condition, cool, dry, firm, and free from the slightest taint, and it has been hard to convince experienced butchers and salesmen, who saw it for the first time, what they were inspecting. The invention has now been tested to an extent which leaves no doubt that fresh meat can be, as it has been, imported from Canada and the United States, and be sold and eaten here without the consumer knowing he has not been enjoying a cut from a prime 'Scot.'"

In short, the experiment is a complete success, and weekly consignments of 50 tons of beef are now sent from New York, which will soon be increased to 200 tons, the maximum possible under the present arrangements. There is little doubt that other steamship companies will ere-long follow the example of the Guion line, and the facilities for the new business be largely increased.

DELICATE TESTS FOR LEAD IN DRINKING-WATER.

There is, perhaps, no subject of more vital importance to every man, woman, and child, in city or country, than the water they drink. First and most dangerous, but often easily avoided, is organic matter. Next to this are the metallic contaminations, chief of which is lead. The writer was somewhat amused and horrified one day by a remark heard when stopping at an unpretentious farm-house in a most retired spot among the highlands of Eastern New York. He congratulated the proprietor that although the inmates of that house were deprived of some of the enjoyments of more densely peopled sections, they at least enjoyed pure, wholesome water, flowing as it must over granitic rocks. "Oh, yes," was the reply, "there is an excellent spring just over the hill, from which we bring our water through a *lead pipe*; it is excellent water, and quite *soft*." We did not examine his gums, stained with the juice of the weed, to see if there were any blue lines of lead, but turned sorrowfully away, after a few words of warning.

The question is often asked, especially in scientific and semi-scientific journals, How can we detect lead in water? The almost universal method is to add sulphydric acid gas or its solution. Few who are not chemists know how to prepare this reagent, and fewer still how to employ it. When carefully used it is an exceedingly delicate test. To ascertain the limits of its efficiency the writer made the following experiment. A solution of nitrate of lead in boiling distilled water, of such strength that one gallon of water should contain two grains of metallic lead, was first prepared. When one part of this solution was diluted with 40 parts of water, the color produced by a solution of sulphydric acid was so faint as scarcely to be relied upon. When, however, the standard lead solution was diluted with only 20 times its volume of distilled water, the change of color was very distinct. Hence we may say that sulphydric acid, freshly prepared, may be relied upon to detect one part of lead in 600,000 parts of water, or $\frac{1}{10}$ of a grain in a gallon.

A corresponding experiment with ammonic sulphide proved that not less than $\frac{1}{3}$ of a grain in a gallon can be detected by this reagent.

Potassic dichromate (bichromate of potash), on the other hand, proved quite as delicate as sulphydric acid, proving beyond doubt the presence of one part of lead in 600,000 parts of water. In testing with a colored reagent like this, it is advisable to aid the eye by comparative tests. A certain quantity of the water to be tested is placed in one test-tube, and an equal quantity of distilled water in another. A drop or two of the reagent is added to each, and the colors compared both by reflected and by transmitted light, falling at various angles. If the quantity of lead is very small, the solution containing it becomes somewhat lighter in color, but less transparent than the other.

The advantages claimed for the potassic dichromate are that it is more easily obtained and manipulated, does not decompose, has no odor, is less poisonous, and is quite as reliable as any other test.

E. J. H.

MEMORANDA IN THE ARTS.

Japanese Camphor. — The tree which supplies the camphor of commerce coming from Japan is the *Laurus camphoratus*, in Japanese, *Jennoki*. It is widely distributed, but flourishes best in the southern parts of the country, especially in the province of Tosa in the island of Sikok. The sea-coast, with its mild, damp air, is favorable to it. The production of camphor is carried on the whole year round, but best in winter. The workmen erect a temporary hut, with ovens, etc., in some neighborhood where there are camphor-trees. After hewing down a tree they cut it into small, regular chips, which are taken in baskets to the oven, which is generally on a slope where there is a flow of water. Here the material is distilled in the wet way. The camphor, carried off in vapor and deposited, is afterwards gently pressed, thus yielding about 25 per cent. of clear oil. This at present serves no other purpose than that of a lighting material for poor people; notwithstanding a strong smell and much smoke, they burn it in open lamps. Completely purified camphor is not exported from Japan, the product undergoing further distillation in Europe. The camphor chips or shavings, after drying, are used as fuel.

The Electric Light in Paris. — We learn from recent foreign journals that the luggage-room

of the Paris terminus of the Great Northern Railway has been lighted by means of electricity for some days, and so successful has the experiment proved that it has been decided to light all the waiting and luggage-rooms of the principal Paris railway stations by means of electricity. By working the Gramme machine with three horse-power, as much light is obtained as that given by a hundred gas-burners. The electric lantern is placed at a height of ten metres (about 32 feet) from the ground, and sheds a soft, clear light over an area of 20,000 square feet.

The Manufacture of Sham Antiques in Italy. — It is said that the Italians who make a living by selling sham antiques of various kinds, in wood, marble, and paint, believe that the credulous Anglo-Saxons from both sides of the Atlantic, who pay liberally for such wares, are sent to them direct by the divine agency of the Blessed Virgin. It is no wonder that the Italians are such devout worshippers of the Virgin Mary. A correspondent of *The Academy* says: "Literally thousands upon thousands are spent upon false pictures, false carvings, false bronzes, false china, false objects of art of every kind, manufactured by skilful Italians, whose services in an honest direction, if directed by competent employers, would be of infinite benefit to the community." A Tuscan modeller, named Bastiannini, passed his whole life modelling imitations of old objects of art, which he succeeded in passing off as genuine to the purchasers for the Louvre and for other art museums.

Condensed Eggs. — A factory has lately been established at Passau, in Bavaria, to work a process for supplying eggs in a condensed form. The eggs are dried and then reduced to a fine meal. This is packed in air-tight tins, and thus a supply of the most complete food is provided in the smallest possible compass.

Statue of Humboldt. — Professor Drake, of Berlin, has completed his colossal statue of Humboldt, which, cast in bronze, is to be dispatched to Philadelphia. The philosopher is standing, in modern costume, with a large cloak disposed on his shoulders, holding a book in one hand, and having the other hand on a globe.

PRACTICAL HINTS AND RECIPES.

To Prevent Glue from Cracking. — Glue frequently cracks because of the dryness of the air in rooms warmed by stoves. An Austrian journal recommends the addition of a little chloride of calcium to glue to prevent this disagreeable property. Chloride of calcium is such a deliquescent salt that it attracts enough moisture to prevent the glue from cracking. Glue thus prepared will adhere to glass, metal, etc., and can be used for putting on labels without danger of their dropping off.

A Good, Durable Whitewash. — An English journal says: "In answer to a correspondent who asks for a whitewash that will stand exposure to the weather, we give the following, which we know to be good: Take half a bushel of freshly-burned lime, slake it with boiling water; cover it during the process, to keep in the steam. Strain the liquid through a fine sieve, and add to it 7 lbs. of salt previously well dissolved in warm water; 3 lbs. of ground rice boiled to a thin paste and stirred in boiling hot; ½ lb. of powdered Spanish whiting; 1 lb. of clean glue, which has been previously dissolved by soaking it well, and then hanging it over a slow fire in a small kettle, within a large one, filled with water. Add 5 gallons of hot water to the mixture, stir it well, and let it stand a few days covered from dirt. It must be put on quite hot. For this purpose it can be kept in a kettle on a portable furnace. About a pint of this mixture will cover a square yard."

Agriculture.

THE TRAVELS OF PLANTS.

Many familiar plants have been great travellers in their day. Some that are now thoroughly domesticated in our own land, and which we might suppose to be true "native Americans," are merely naturalized foreigners from beyond the sea; and, on the other hand, some that belong to the vegetable aborigines of this Western hemisphere have migrated to the Old World, and are now quite at home in the "cultivated" circles of Europe. The birthplace of some is not easily traced, as their travels began in prehistoric times and they are now citizens of the world, bearing no mark of their primal home. The wanderings of others have been confined to modern days, and are recorded with more or less accuracy.

In ancient times, plants were oftener distributed by warriors than in any other way. Alexander brought rice from Persia to the Mediterranean, the Arabs carried it to Egypt, the Moors to Spain, and the Spaniards to America. Lucullus brought the cherry-tree (which takes its name from Cerasus, the city of Pontus where he found it) to Rome, as a trophy of his Mithridatic campaign; and 120 years later, or in A. D. 46, as Pliny tells us, it was carried to England. Cæsar is said to have given barley to both Germany and Britain. According to Strabo, wheat came originally from the banks of the Indus, but it had reached the Mediterranean before the dawn of authentic history. Both barley and wheat came to the New World with its conquerors and colonists, and the maize which they found here soon went to Europe in exchange. It was known in England in less than fifty years after the discovery of America; it was introduced to the Mediterranean countries, by way of Spain, at the end of the sixteenth century, and the Venetians soon carried it to the Levant. Later it travelled up the Danube to Hungary, and gradually spread eastward to China. While it was thus invading the regions formerly devoted to rice, the latter, as we have said, was establishing itself in this country.

The sugar-cane, which with its sweet product was known to the Greeks and Romans only as a curiosity, seems to have been cultivated in India and China from the earliest times. Its introduction into Europe was one of the results of the Crusades, and thence it was transplanted to Madeira, and early in the sixteenth century from that island to the West Indies. The original home of "King Cotton" was probably in Persia or India, though it is also mentioned in the early annals of Egypt, and had spread throughout Africa in very ancient times. The tea plant has not proved a very good traveller, though its dried leaves have been carried in such quantities throughout the civilized world. The English have, however, succeeded in naturalizing it in Assam, and a very fine quality of tea is now produced there.

It is a curious fact that the use of the coffee berry was unknown in its native country, Arabia, until a mufti of Aden introduced the beverage from Persia, where he had acquired a taste for it. It has now become established in most of the tropical lands colonized by Europeans, who did not themselves become acquainted with it until late in the sixteenth century.

The potato was found in Peru and Chili by the first explorers of those countries, who soon carried it to Spain. It is said to have reached Burgundy in 1560, and Italy about the same time. It appears to have been brought from Virginia to Ireland by Hawkins, a slave-trader, in 1565; and to England in 1585 by Drake, who presented some tubers to Gerard, who planted them in his garden in London and described the plant in his *Herball;* and it was also introduced by Raleigh at about the same date. But it was slow to attract attention, and it was not till nearly a century later that it began to be much cultivated. In 1663 the Royal Society published rules for its culture, and from that time it rapidly gained favor. The Dutch carried it to the Cape of Good Hope in 1800, and thence it made its way to India.

The travels of the bread-fruit tree became notorious in connection with the mutiny of the Bounty. A recent English writer gives the following facts in this connection: —

On Dampier's return from the South Sea Islands he brought accounts of this tree which astonished the civilized world, and the botanists of Captain Cook's expedition to the Society Islands afterwards described it as "the most wonderful vegetable in the world," and represented the excellence of its yellow, sweet fruit in such glowing terms that the British public became excited, many persons being bitten with the idea of unadulterated bread and penny loaves growing ready baked on a tree! Petitions on this subject were sent to George III., and at length the Bounty was fitted up for the purpose of conveying the tree from the Pacific to our colonies in the West Indies. She arrived at Tahiti in 1788, and shipped 1500 young trees, with which her commander, Bligh, set off, intending to round the Cape of Good Hope, when the mutiny broke out, and the trees were lost. But the proposed migration was afterwards accomplished by the same navigator, and the cape was passed without exposing the bread-bearing plants to a temperature below 61° F. Some of the trees were left at New Holland, others at St. Helena, and the rest were landed at Jamaica and St. Vincent, and the vessel freighted from the botanical garden there with plants for Kew.

In modern times, useful plants have been carried to all new countries and colonies where the soil and climate suit them. Australia, for example, was singularly bare of native fruits; possessing originally only a few poor species of currants and plums, she has become a land of fruits and flowers too numerous to mention. Peaches, nectarines, pine-apples, plums, pears, apples, oranges, lemons, citrons, strawberries, bananas, and mangos, with many other fruits, including the grape, all grow in perfection in Australia, as does the grain of Europe generally, and wheat especially.

We have given but a few illustrations of the travels of plants, out of a multitude that presented themselves. A volume could be filled without exhausting the subject.

SETTING MILK.

The following is the report of a committee appointed by a farmers' club in Bucks County, Penn., to make a comparative trial of setting milk in deep and in shallow pans: —

The pool for deep cans is 36 inches long, 12 inches wide, and 20 inches deep, holding 36 gallons of water. This pool is filled with ice-water, flowing from the ice-box in the top of the refrigerat-

ing or cooling cupboard, and when it is filled, the surplus water is conducted in pipes to the drain, and passes out of the building. The melted ice-water keeps this pool at a temperature of 58°. Four deep cans were expressly made for the purpose, 8½ inches in diameter and 20 inches deep, capable of holding 5 gallons, or 20 quarts, of milk, if filled to the brim; but 18 quarts, or 4½ gallons, fills them 18 inches deep, which is quite as deep as they should be filled for convenience in handling. A "conical-shaped dipper," of the approved pattern, was also made for dipping off the cream from the deep cans, and likewise a large kettle, capable of holding 10 gallons, in which to mix all the milk used in the trial. The trial commenced on Monday morning, August 19, 1874. On account of a scarcity of milk in the mornings, but 8 gallons were used at a time during the trial. Four gallons of measured milk were put in one deep can, filling it just 16 inches deep, and weighing 34 pounds. The same quantity of this previously mixed milk, by weight and measure, was put in 4 ordinary tin milk pans (4 quarts to the pan), filling them 3 inches deep. This was repeated for 14 milkings, one week — making a total of 476 pounds, or 224 quarts of milk, 16 inches deep in 14 cans, and the same amount in 56 pans, 3 inches deep. The water in the pool, as before stated, was at a temperature of 58°. When a can of warm milk was immersed in it, it raised the temperature to 60°, but by the expiration of 10 or 12 hours it would be lowered to 58° again by the inflow of fresh ice-water. A piece of ice was put in the pool after the third day, so as not to let the temperature be varied any more than could be helped. The pans of milk were set on a stone floor where the temperature was 60°. During the whole trial the temperature ranged as follows: In the pool from 58° to 60°; in the milk room from 60° to 68°. Great care was taken to preserve the uniform temperature during the whole trial by admitting cool air at night and excluding the warm air during the day, which necessary feature is under complete control. The milk in both cans and pans stood 48 hours, when it was skimmed. The cream rose one inch in depth in the deep cans. The amount of cream obtained from the deep cans was 46 pounds, from the shallow pans 57 pounds. The last skimming was done on Tuesday evening, August 18th, when the cream was placed in a cooling cupboard, and the temperature lowered to 54°. The churning was done Wednesday, August 10th. The 46 pounds of cream obtained from the deep cans was churned first; butter came in 30 minutes, and yielded 15 pounds 10 ounces. The cream from the shallow pans (57 pounds) was churned immediately afterwards; butter came in 50 minutes, and yielded 21 pounds 6 ounces. The result of this experiment, which was conducted as fairly as possible, indicates a gain of 5 12–16 pounds in favor of the shallow pans, or over 25 per cent.

HOW TO PACK BUTTER.

Professor Arnold, in the *Tribune*, gives the following directions for packing butter so that it will keep sweet for eight or nine months:

"Make a brine with a saturated solution of the purest salt you can get, using a pound of saltpetre to about twenty pounds of salt. Scald the brine by bringing it to a boiling heat, skim, and apply when sufficiently cool. The casks should be carefully prepared as well as the brine. If the gum and sap in the wood are not removed before the casks are used, they will work out into the brine and affect the butter. To remove the woody flavor from the casks, a thorough steaming with a high pressure is the quickest and best means. If soaked before the steam is applied, hot steam will cut the gum and woody flavor all out in a short time. If steam is not convenient, soak in brine a week or so, and then fill with boiling hot brine, and let it stand till it gets cold. By keeping the butter under the brine, the casks full and in a cool place, the butter will keep safely. Some of the tin-lined packages which have recently been introduced, and which are easily hermetically sealed, would be much more convenient and probably fully as cheap as the oak casks and brine, and are claimed to be equally efficient in preserving."

In regard to the use of earthen jars for packing butter, another correspondent says: —

"I have kept a dairy of fourteen to eighteen cows for some years, and find most persons prefer earthen jars to wood. Where I send the butter to families, these jars are returned each season to be refilled. We find it impossible to cleanse the inside of the cover if it is not glazed; it absorbs every taint or bad odor that may come in contact with it, and every such tainted cover is sure to spoil the contents of the jar. I have had jars of butter spoiled in forty-eight hours so they were not fit to use. If the inside of the cover could be glazed, it would save much loss of butter packed in jars. I find many covers are tainted before the jars are filled, as many merchants keep their jars in cellars, or near kerosene or some other rank-smelling substance."

COOKING CARROTS.

It is a notorious fact that we Yankees, like our English cousins, are lamentably unskilful in cooking vegetables, which the French serve up in such an endless variety of delicious forms. In the country, where fresh vegetables can be had so easily, they are even worse treated than in the city. In fact, they are usually cooked for the family just as they are for the cattle and the pigs. There is no more thought in the one case than in the other of making them savory as well as wholesome. We have before given some excellent foreign recipes for cooking potatoes, which with us are almost invariably boiled or fried, and abominably in either case. We now select from the London *Garden* some hints for cooking carrots, which the average Yankee housewife never thinks of serving in any other way than "plain boiled." The contributor has tested all these, and vouches for their merit: —

Carrot Soup. — Take 1½ lbs. of carrots which have been first brushed very clean, then boiled, until tender, in slightly salted water; mash them to a smooth paste, or rub them through a sieve; mix the paste with 2 quarts of boiling soup (strong beef broth will do); season this with pepper and salt, and add, before being finally boiled up, a small lump of sugar and a piece of butter. Serve with a dish of bread cut into small dice and fried in butter.

Carottes au Beurre. — Boil sufficient carrots for a dish until they are quite tender; drain them well, and whilst this is being done dissolve from 2 to 3 ounces of butter in a sauce-pan, and strew in some minced parsley, some salt, and white pepper or cayenne; then add the carrots, and toss them very gently until they are covered with the sauce, which should not be allowed to boil. Cold carrots may be re-warmed in this way.

Stewed Carrots. — Half-boil half a dozen large carrots without cutting them; then slice them into a stew-pan; put in enough good stock to nearly cover them, with pepper and salt to taste. Stew them till tender; then mix in a separate vessel half a pint of cream and a tablespoonful of flour, and add to the carrots with one ounce of butter. Boil up and serve. Small young carrots may be dressed in the same manner, and will, of course, require less time to cook them.

Carottes a la Maitre d'Hotel. — This is a genuine French recipe. Scrape twenty small young carrots and wipe them, but do not wash them. Put them into a pan with 6 ounces of fresh butter; cover the pan, and toss the carrots over the fire from time to time. After a quarter of an hour add salt and pepper, a chopped onion, and parsley. Cover the pan and gently toss it again from time to time, until the carrots are tender. If you use large carrots, cut them into slices and boil them in water until they are nearly done. Drain and finish them as above.

Carottes a la Poulette. — Take some young carrots; scrape and wipe them carefully. Put them in a pan over a moderate fire, with 6 ounces of butter and a tablespoonful of flour; toss them repeatedly, and take care the flour does not become brown. Pour a tumblerful of milk into the pan, cover it, and let the carrots simmer slowly until they are done. Then take the pan from the fire, and pour into it two yolks of eggs, mixed with a tablespoonful of good cream, and a little pepper and salt; warm these ingredients, taking care not to let them boil, and serve.

Carottes au Jambon. — Put into a pan 6 ounces of butter and a tablespoonful of flour; simmer these over a quick fire, until they become slightly brown. Add a gill of boiling water, then 6 ounces of raw ham cut into small dice, a little salt and pepper, a bay leaf, a small bunch of thyme and parsley, a large onion, and six large carrots cut into slices the size of a half-crown. Cover the pan, and let the carrots boil until they are done. Then take out the seasoning, and serve. This recipe also answers well for turnips.

GLEANINGS IN FOREIGN FIELDS.

Agricultural Schools in Germany. — Prussia has four higher agricultural academies, with 80 well-paid professorships; 41 lesser colleges, all connected with model farms; five special schools for the cultivation of meadows and for the scientific study of irrigation; one special school for the reclamation of swamp lands; two special schools for industrial agriculture; one school for horse-shoeing; one school each for silk and bee raising, and pisciculture; 20 agricultural stations (laboratories) for experiments and for garden culture; three higher colleges and 12 secondary schools in which the culture of the grape-vine is made a specialty. All these schools are connected with model farms for the practical education of students. That of the Academy of Proskau contains no less than 2450 acres of farming land, and 14,700 acres of forests. Bavaria, a country of 5,000,000 people, has 26 agricultural colleges, 269 associations for the advancement of agricultural scientific knowledge, and the celebrated polytechnic school at Munich contains a separate branch for higher agricultural instruction. The whole of the German empire to-day contains 184 agricultural colleges, of which number eight are connected with the great Universities of Leipsic, Halle, Göttingen, Berlin, Königsberg, Heidelberg, Giessen, and Jena; five colleges for horticulture, 75 practical middle schools for agriculture, 28 middle schools for garden culture, 16 colleges for special branches, besides an immense number of larger and smaller associations, evening schools for the further education of farmers' youths, lecture courses by travelling professors, etc.

American Canned Tomatoes in England. — A correspondent of the London *Garden* grows quite enthusiastic over some canned tomatoes he had ordered from this country. He says: "Anything so satisfactory in the way of preserved fruit or vegetables I have not tasted; the contents taste as well as if gathered from the plants fresh. There is no admixture of any foreign body, such as occurs in tomato sauce, only the pure tomato, which requires to be warmed to be perfectly enjoyable. I

am surprised that the producers do not open agencies here, for there is no doubt that even at present London could consume the produce of many scores of farms. I may add that I have no interest in the matter beyond the desire to make known a real boon to every housekeeper who cares to have such a delicacy always at hand. I first tasted good tomatoes in America, a few years ago, and have always thought them indispensable since, though I can rarely get them good in London. Unfortunately, the autumn supplies of 'fresh' tomatoes in our markets are often bad, spotted, and even rotten. The very extensive supplies of tomatoes that come from Lisbon must be gathered too green, and are often in bad condition on arrival. This year, too, the potato disease virulently attacked the crops of tomatoes in the London market gardens. Therefore this admirable tomato-preserving industry is of as great, if not greater, value to us than to the people among whom it originated — from their desire to enjoy, through the long white winters of northern America, the produce of their summer fields."

Seeds Germinating in Ice. — Having observed that seeds of *Acer planatoides* and *Triticum*, which happened to have come into an ice cellar with some blocks of ice, had germinated between these, M. Uloth was led to experiment on the subject. He placed seeds of various species in grooves made in ice blocks (inclosed in cases), over which he laid plates of ice, and kept the whole in an ice cellar. Other similar seeds were sown in earth surrounded by ice. The cases were placed in January, and observed in March and May. A number of seeds germinated, and those of cruciferæ and gramineæ seemed to do so with special facility. Those in ice and those in earth seemed to germinate pretty equally. The roots penetrated into the ice (in the former case), and an interesting question arose as to how this occurred. M. Uloth considers that the process was facilitated by the heat liberated in growth of the root, melting the ice. M. Sachs thinks that the ice (in the original case, which suggests these experiments) being surrounded by warmer bodies, these may have heated the roots by radiation; but M. Uloth points out that in his experiments the ice was too thick for this, and if such a cause had operated, other bodies frozen in the ice, such as straw and wood chips, would have got heated and sunk in the ice, which was not the case.

Daughter and Milkmaid. — It is an interesting fact that our word *daughter*, when traced back, through the Greek θυγάτηρ, to its source in the Sanscrit *duhitri*, is found to be equivalent to *milkmaid*, showing that it was the duty of the Indian maidens to milk the cows. It was no doubt considered a highly honorable office, since the cow, the most valuable animal to a pastoral people, soon came to be endowed with supernatural attributes.

A New Insecticide. — At the last meeting of the Royal Horticultural Society, the Hon. and Rev. J. T. Boscawen called attention to his insecticide, which consists of camphor dissolved in methylated spirits to saturation, and mixed with soft soap to the consistence of cream. When diluted so as to be fit for use with a syringe, this had been found a most efficacious substitute for fumigating in the case of mealy-bug, scale, red spider, etc.

Weather Rhyme from Down East. — The following is published in the London *Notes and Queries* as being a description of the local weather given by the inhabitants of the coast of Maine, but whether it originated there we do not know: —

"Dirty days hath September,
April, June, and November;
From January up to May,
The rain, it raineth every day.
All the rest have thirty-one,
Without a blessed gleam of sun;
And if any of them had two-and-thirty,
They 'd be just as wet and twice as dirty."

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Jas. R. Nichols, M. D., *Editor.*

Wm. J. Rolfe, A. M., *Associate Editor.*

BOSTON, MARCH 1, 1876.

THE GREAT IOWA METEOR.

One year ago, February 12, 1875, a meteor of extraordinary splendor appeared in the heavens, over the State of Iowa, and after dazzling the eyes of all those who were so fortunate as to see it, burst asunder with a loud report, and in a few seconds disappeared. Fragments of this meteoric mass were scattered over a wide extent of country, and more than seven hundred pounds have up to the present date been picked up by various persons, and sold to geologists, chemists, and others, at high prices.

We are under great obligations to C. W. Irish, Esq., civil engineer, of Iowa City, for a splendid specimen of the stone, which he kindly sent to us last autumn. The specimen weighs about eleven ounces, and accompanying it was a small fragment, which was sent for chemical examination. Our time has been so occupied that we have not been able to bestow upon it analytical labor, but intend shortly to do so. We presume, however, that it does not differ essentially from the specimens examined by Professor Hinrichs, and we present in tabular form his results: —

Meteorites.	Iron.	Nickel.	Sulphur.	Ferrous Oxide.	Magnesia.	Lime.	Silica.	Sum.
Non-Magnetic:								
Troilite	1.1	–	0.7	(1.5)	–	–	–	1.8
Hyalosiderite	–	–	–	15.2	17.5	0 6	19.6	52.9
Hypersthene	–	–	–	8.8	9.7	2.2	24.2	44.9
Loss, traces	–	–	–	–	–	–	–	0.4
Sum	1.1	–	0.7	24.0	27.2	2.8	43.8	100.0
Magnetic:								
Nickeliferous Iron.	6.6	0.9	–	–	–	–	–	7.5
Total	7.7	0.9	0.7	24.0	27.2	2.8	43 8	107.5

The stone in physical appearance resembles in most respects those which have fallen upon other parts of our planet, but in chemical composition it varies essentially. It is covered with a black crust formed during the cosmical part of its motion through the earth's atmosphere. This crust, in the view of Professor Hinrichs, is not due to fusion, but simply to the heating of the outer layer of the stone to a red heat. The interior is of a grayish color, and resembles iron stones of terrestrial origin; when exposed to a red heat the color is changed to a black like the crust.

Mr. Irish has published a very carefully prepared and interesting account of the Iowa meteor, and it is understood that he is nearly ready to present further information, the results of observations, which will be looked for with interest. Great credit is due to him for the intelligent zeal with which he has followed up his investigations relating to this extraordinary celestial visitant.

We perhaps ought to add that the specimen sent to us was found by Mr. John Shipton, on the farm of J. Donaldson, in Iowa County. These gentlemen have aided much in securing fragments of the stone and in facilitating a knowledge of the facts concerning the movements of the meteor.

UTILIZING THE OCEAN WAVES.

In our article some months ago upon new sources of mechanical power, we did not refer to the possibility of making some use of the rise and fall of ocean waves. There is enormous force in the motion of those great masses of water, which lift the largest ship as if it were an egg-shell, and it has been more than once suggested that the power might be turned to some practical end. The subject has been discussed before scientific societies as widely separated as England and Australia. At a meeting of the Royal Society of Melbourne last summer, the president stated that some months before, Mr. R. S. Deverell had devised apparatus by which the movements of a ship at sea could be registered; and observations were made with it by his brother, who went to England in the Norfolk. The duration of the voyage was 2026 hours, and in that time the ship made 1,764,088 beam oscillations or rolls, and 1,041,137 fore-and-aft oscillations or pitches. This may seem a large number to landsmen, but no one who has made an ocean voyage in a screw steamer will think it exaggerated. The average number of oscillations in both directions per minute was fourteen. The aggregate of beam movements registered by a pendulum was over 15,000,000 degrees, while that of the fore-and-aft movements was nearly 5,000,000 degrees. Mr. Deverell considered that he had established (1.) That between ocean limits the swell of the ocean is unceasing. (2.) That the oscillation of a vessel in an ocean fetch is unceasing. (3.) That the motion of an independent body within a ship on the ocean is unceasing. Here, then, is an immense amount of conservable energy. Can it be conserved for use on board ship? Mr. Deverell said he believed it could be made useful in auxiliary propulsion, and that he hoped to be able soon to bring before the society a method of putting his proposition into practice.

More recently Mr. Beauchamp Tower, at a scientific gathering in England, has described a machine for obtaining motive power from the motion of a ship among waves. An English journal gives the following abstract of his paper on the subject: —

"The machine consists in principle of a weight supported on a spring, so that it can oscillate on the spring through a considerable range in a vertical line. The scale of the spring, and consequently the natural period of oscillation of the weight, can be varied at will. When it is so adjusted that it synchronizes with the waves, the oscillations become very violent, and a large amount of power can be obtained from them. In practice, the springs consist of highly-compressed air pressing on the rims of hydro-pneumatic cylinders, and the arrangement is such that the vessel containing the compressed air forms the moving weight. The author exhibited a design of a machine for working an auxiliary propeller of a sailing ship of 1800 tons displacement.

The moving weight in this case is 200 tons, and he showed by calculation that it would give about 30 horse-power in the long swell met with in the tropical calms, 260 horse-power in average ocean waves, and more than 600 horse-power in a heavy head sea. The space occupied by the machine compares favorably with a steam-engine of the same power. The author exhibited a model of the machine, which recently, in a moderate sea, had yielded power at the rate of 1½ horse-power per ton of moving weight."

On the face of it this looks plausible enough, and we believe that something practical will come out of it. At present the lifting power of the waves is chiefly illustrated by their action upon the muscles of the human stomach, which they stimulate to "raising" whatever has been rashly put therein by inexperienced voyagers. If they can be set to do more useful work, and especially if they can help the vessel on her way, and thus shorten the penance of the voyage, it will be a matter for rejoicing among travellers.

THE VITALITY OF SEEDS.

That certain seeds will retain their vitality a very long time under favorable conditions has been established beyond a doubt, though the oft-repeated statement that grains of wheat from Egyptian mummy-cases have sprouted has never been satisfactorily proved. Careful experiments made by scientific men to settle the question have furnished only negative results. If the seeds are exposed to atmospheric influences they are not likely to retain their vitality many years; but if buried in the earth they will retain it much longer, and possibly for an indefinite period. A recent striking illustration of this was the springing up of certain species of plants on ground laid bare at the Laurium mines in Greece. In that case the seeds must have been covered for nearly eighteen hundred years, as the mines were abandoned in the first century of the Christian era, and the species have since become utterly extinct in the district.

This fact that living seeds may be lying too deeply buried for germination is one which sometimes has a practical importance. It is said that in some parts of England, where the arable land has been much infested with the charlock, and the farmer has succeeded in nearly exterminating it, he is very careful not to plough deeper than usual, which invariably brings a quantity of fresh seed within germinating distance of the surface of the soil, and causes the weed to spread again with renewed vigor. Having similar facts in view, Dr. H. Hoffmann has been experimenting with soil taken from the diluvial beds of the Rhine districts, and has published the results in the *Botanische Zeitung*. About eighty pounds of soil were taken out at a depth of twelve feet below the surface, when the earth was being levelled for a railway station at Monsheim, near Worms. A newly-broken spot was selected, and the tools were previously cleaned with well-water. In fact, every conceivable precaution was taken throughout the experiment to prevent the intrusion of foreign seeds or spores. Notwithstanding all this care, various common mosses, ferns, and flowering plants sprang up in the pots, which were closely covered with bell-glasses. It is noteworthy, too, that all the species that appeared in this way were common either in the greenhouse or in its immediate vicinity, and not in the locality whence the soil was procured. A similar set of experiments was instituted with white tertiary sand, and the result was the same. The experiment with the soil from Monsheim was also tried again. In this instance the only plant that could possibly have sprung from a seed in the long-buried soil was *Festuca pratensis*, but this was a delicate plant, probably from a very small, light seed, that might have been conveyed by the air.

These experiments, however, cannot be considered as settling the question, for it is not likely that all deep soils contain latent seeds. Even if such seed-bearing soils were quite common, we might try many samples before happening to light upon one. On the other hand, as at Laurium, a subsoil might accidentally be uncovered in which the buried seeds would at once show the vitality that had remained dormant for ages. If the facts in this instance have been correctly reported in scientific journals (and we have no reason to doubt it), they are quite conclusive. The species being new, — in our day, at least, — the seeds could not have been recent ones introduced by accident, as was probable in Dr. Hoffmann's experiments; so that even if wheat from mummy-cases cannot be proved to have sprouted, it is pretty certain that this has occurred in the case of seeds eighteen centuries old. How much longer they might have retained their vitality it were idle to conjecture, but we have no reason for supposing that their lease of latent life had nearly run out.

THE "MYRTLE ROBIN" OF OREGON.

Dr. F. S. Matteson, of Coquille, Coos Co., Oregon, sends us the following description of a bird known in that section as the "myrtle robin," which he does not find described in any book he has seen: —

He is of the thrush family, somewhat smaller than the common red-breast robin, which he resembles in shape and action, but not in color.

His bill is straight and black, except the basal third of the inferior mandible, which is yellowish; three fourths as long as the head, corneous, not cered, the upper mandible slightly recurved. The head is black, with a richly dappled shading, passing on the back into a lustrous ashy-brown, with the same dappled shading. Commencing immediately over the eye and passing backward, nearly but not quite around the neck, is a reddish-golden-yellow, somewhat irregularly defined stripe, about one eighth of an inch wide. There are some white touches on the lower eyelids. The throat is reddish yellow. A black band encircles the breast at its junction with the neck; the rest of the lower part of the body is reddish yellow, fading to nearly white at the crissum. Under tail coverts are brown at base, becoming white, with yellow edgings. The feet are yellow, the tarsus is flesh-colored and "booted," and the legs are feathered to the heel with short, close, grayish brown feathers. The primaries are ten; the first spurious. The wings are tipped with ashy brown, and barred and shaded with reddish yellow; under side of wing ashy brown, with a broad white band running across it, tipping with white the under wing coverts, with another smaller, irregular, whitish band near the base. The retrices are 12, 4 inches long, dark ashy brown above, lighter below, the outer ones being tipped with whitish yellow. The bird is 9¼ inches long; wing 6½ inches, spread, 15 inches; bill three fourths inch; eye black; nostril oval, and covered.

If he is a singer I have never had the pleasure of hearing him. His only note, as far as I have heard, is a low, quick, distinct chirp, repeated at regular intervals as he hops along the ground, or flits among the shadows of the myrtle groves, in which he delights to dwell. Of his habits I know but little. His nest I have never seen. He is shy, but not wild, preferring the shadowy recesses of the forest to the open fields. In spring his reddish hues become more brightly golden, and he glances along, a vision of beauty, amidst the bright green myrtle foliage. In summer I have seen him seldom; in winter he is often seen.

I am securing specimens and studying his habits as opportunity offers, for whether he is a new species or not, he is certainly a beauty.

EDITORIAL NOTES.

Asparagus Indigenous to this Country. — A correspondent in Springboro', Ohio, writes us as follows: "In your article on asparagus, you say that you do not know of any locality where it is indigenous to this country. Forty-five years ago it could be gathered on the eastern side of the Chesapeake Bay, along the shores of Kent Island. It was the most delicious I ever ate, as it was submerged twice in twenty-four hours by the tide, which made the growth most luxuriant. The plant for the table should never be cut shorter than eight inches, excluding all the white part, as that is hard and bitter."

Liebig and Cavour. — The last number of the *British Quarterly Review*, in an able article on "Political Questions in Italy," gives the following interesting example of chemical figurative language: "Liebig, the illustrious chemist, said to Cavour in 1854, 'Don't be disheartened! If in a heap of dead matter there is an organized and living *molecule*, it suffices to organize and recall into life all the rest. I believe that this little Piedmont, at the foot of the Alps, is the living molecule which will conquer the forces of death and impart the movement and warmth of life to all the rest.' And such amidst the rest of Italy did Piedmont exactly prove to be, with its king, its men of state, and of war."

A Quatrain of Good Rules for the Student. — The following four precepts of Descartes are quoted by Viollet-le-Duc in his "Discourses:"

The first is never to admit the truth of anything without thorough conviction; that is, sedulously to avoid precipitation or prepossession of judgment, and to accept nothing as fact which does not recommend itself so clearly and distinctly to my mind that there can be no possible occasion to doubt.

The second is to divide the subject I am investigating into as many heads as it is capable of, to the end that its difficulties may be the more readily resolved.

The third, so to order my thoughts that, beginning with the most simple and comprehensible objects, I may gradually ascend to the contemplation and understanding of the most complex, assuming a regular order of induction in those subjects which do not seem naturally so to arrange themselves.

The last, always to make such thorough and comprehensive reviews of my studies as to prevent the possibility of omitting or not giving due weight to any of the considerations which bear upon them.

A New Enterprise of Cook the Tourist Agent. — We learn from the *London Medical Times and Gazette* that Messrs. Cook and Son (who have been intrusted by the Khedive with the complete control of the Nile steamers) have established a well-appointed sanatorium just above the first cataract. The situation chosen is said to be one of the most beautiful to be found anywhere on the Nile; it is on the right bank of the river, opposite the island of Philæ, just on the edge of the desert,

and close to a picturesque grove of palm-trees. A steamer runs fortnightly from Cairo to the second cataract, and invalids may start thence for the sanatorium in the middle of November. It is even contemplated to organize a weekly service of steamers, and resident medical aid is promised.

COD-LIVER OIL. — We have elsewhere given some facts concerning this important remedy, which we believe will interest all our readers, and not the professional ones alone. We may add that Messrs. Billings, Clapp, & Co. are always prepared to furnish the oil, of reliable quality, made expressly for their trade from the best materials and by the best methods. They also make a specialty of the combination of *Cod Liver Oil and Hypophosphites*, which they introduced several years ago, and which has proved a most valuable remedial agent.

SPECIAL NOTICE. — Any person having a complete set of the *first four volumes* of the JOURNAL, in perfect condition, is requested to inform the publishers at what price he will sell them. Address *Journal of Chemistry Co.*, 125 *Milk Street, Boston.*

ATOMS.

FARADAY calculated that the decomposition of a single grain of water required 800,000 discharges of his large Leyden battery. — The coarse, long hair from the neck of an old chamois, if drawn between the finger and thumb, from the root to the point, becomes positively electrified, but if drawn in the reverse direction it becomes negatively electrified. — The trial of the mowing and reaping machines at the Centennial exhibition at Philadelphia will require 50 acres of grass and standing grain, and the Agricultural Bureau of the commission has put the land in the best possible condition. — In 1852, out of the surplus of the great Exhibition of the preceding year, her Majesty's Commissioners bought about 20 acres of land at Kensington Gore, in London, for £60,000; not long ago Mr. Henry Arthur Hunt sold, on behalf of the commissioners, rather less than two acres of this land for the large sum of £103,000. — A French clerical journal, quoted by the *Revue Scientifique*, maintains that the tolling of the church bell is of much greater efficacy than the use of lightning-rods in warding off the effects of a thunder-storm, and advises the faithful to resort to the former means in preference to the latter. — In England, a license has to be taken out by all persons who hire male servants, and at Wandsworth a person has been fined £5 for employing (without license) a boy two hours every morning to clean knives, boots, etc. — The Royal College of Surgeons, in London, has recently discovered that its charter speaks of "persons," and consequently that women are eligible for the examinations and diplomas of the college. — Some instructive experiments on transformation of physical forces can be made by an apparatus lately suggested by a French physicist, and consisting of two Clamond thermo-electric batteries which are made to drive a Gramme machine, and raise a piece of platinum wire in a lamp (inserted in the circuit) to incandescence. — A foreign investigator, one Dr. Gutziet, thinks that he has found ordinary ethylic alcohol in the unchanged sap of certain umbelliferous plants, like the common parsnip; but this remains to be confirmed. — A new form of Leclanché cell has been constructed by Dr. Muirhead, in which the carbon and black oxide of manganese are packed in the outer case, around a glazed porcelain jar perforated with holes about $\frac{1}{8}$ inch in diameter, the jar containing a zinc plate bent in the form of a cylinder; the advantages gained being that a much larger surface of zinc is exposed, and the perforations of the jar are in no danger of being choked up by deposition of chloride of zinc. — A simple and ingenious microscope is suggested by a writer in the *Scientific American:* Two metallic strips form a sort of forceps, in which two holes are bored opposite each other; a drop of glycerine is put in each of these holes, and the drops act as convex lenses, which can be adjusted at will by pressing the strips together. — In the week ending January 1st there were 2494 births in London, and, what very rarely happens, the number of boys and girls was exactly equal, there being 1247 of each. — Liverpool is the most densely populated town in Great Britain, having 99.1 inhabitants to an acre; Glasgow comes next, with 88.1; then follow Manchester with 83.1, Edinburgh with 50.5, Nottingham with 46.2, and London with 45.7. — In our last number we inadvertently stated the joint price of that excellent monthly, *The American Builder*, and the JOURNAL, as $3.00; it is now $3.40, which includes the postage on both, formerly paid by the subscriber. — An Edinburgh tobacconist was lately fined £50 for having in his possession tobacco which, on examination, was found to contain sugar and liquorice. — The able paper on "The Valuation of Commercial Fertilizers," contributed to the *American Chemist* for November, 1875, by Mr. S. P. Sharples, has been reprinted in neat pamphlet form. — The successor of Liebig in the professorship of chemistry in the University at Munich is Professor Baeyer, of Strasburg. — The longevity of English physicians is illustrated by the fact that the *London Medical Times and Gazette* has selected at random from the annual necrology "just one dozen whose united ages amounted to 1075 years, giving an average of 89 years and 7 months to each." — The *Druggists' Circular* records a story of an apprentice in a pharmacy who was on the point of dispensing acid nitrate of mercury in a mixture for which *ac. nit. mur.* was ordered. — The *Commercial Bulletin* in a recent number says: "Dr. J. R. Nichols and W. J. Rolfe, both scholarly and thoroughly practical writers, are making the BOSTON JOURNAL OF CHEMISTRY one of the most valuable as well as most popular publications of the kind in the country."

LITERARY NOTES.

MESSRS. LINDSAY AND BLAKISTON, of Philadelphia, have issued the 2d and 3d Parts of the serial on *Medicinal Plants* noticed in our January number. The full title of the work is "Medicinal Plants, being Descriptions with Original Figures of the Principal Plants employed in Medicine, and an Account of their Properties and Uses. By Robert Bentley, F. L. S., Professor of Botany in King's College, London, and Henry Trimen, M. B., F. L. S., Department of Botany, British Museum." Part 2d contains accurately drawn and colored illustrations, with descriptions, of Theobroma cacoa, Rhamnus catharticus, Prunus amygdalus, Pyrus cydonia, Lobelia inflata, Gaultheria procumbens, and Cinnamomum zeylanium; Part 3d, of Papaver rhœas, Sanguinaria Canadensis, Barosma crenulata, Citrus aurantium, Olea Europæa, Juniperus communis, and Iris florentina. The parts will be issued monthly at $2.00 each, and the publishers will send a sample part to any address on receipt of that amount. The completed work will form an invaluable supplement to the standard treatises on pharmacology and therapeutics.

Messrs. A. S. Barnes & Co. have published a second edition of *Scientific Agriculture*, by E. M. Pendleton, M. D., professor of agriculture and horticulture in the University of Georgia. It is a duodecimo of 443 pages, and is intended as a text-book for colleges, schools, and private students. The first half of the book is devoted to an abstract of botany, meteorology, geology, and chemistry, so far as they bear upon the subject, and the remainder to the consideration of soils, fertilizers, animal nutrition, etc. If most of the first half had been omitted, and the space given to a fuller treatment of the topics in the latter half, we think the work would have been more useful for either educational or practical purposes. If the student takes a separate course in chemistry and botany, he does not need the *résumé* of those sciences given here; if he does *not* take such a course, this meagre abstract will not serve as a substitute.

There are, moreover, many little inaccuracies in this part of the book. Under oxygen we are told that in the processes of combustion, decay, etc., it is "being constantly *set free;*" olefiant gas is called "carbonic anhydride," which is a synonym for carbonic acid; and the like. Throughout the book there is great carelessness in printing proper and technical names. Thus we have "Schonbien" repeatedly for Schönbein, "Rothemstead" for Rothamstead, "glaudulora" for glandulosa, "Chrysti" for Christi, "zanthophyl" for xanthophyl, "forvula" for torula, etc. "Cremor tartar" is given for cream of tartar. There is an old pharmaceutical form, *cremor tartari*, which the writer may have had in mind. If such slips are to some extent pardonable in a first edition, they ought not to appear in a second.

The same house publishes *A Treatise on the Theory and Solution of Algebraic Equations*, by John Macnie, M. A. It is in all respects an excellent work, and will be found a useful complement or sequel to the ordinary algebraic text-books, in most of which the theory of equations is treated either not at all or very imperfectly. The book is elegantly and accurately printed, and is creditable alike to author and publishers.

Martin's Civil Government in the United States (Barnes & Co.) is a neat little text-book on the subject, by the teacher of history in the normal school at Bridgewater, Mass., and is well adapted for common-school use.

Messrs. Barnes & Co. send us also some sample pages of the "Centenary History" soon to appear under the title of *One Hundred Years of American Independence.* It will be a handsome octavo of 600 pages, profusely illustrated with engravings, maps, etc., and promises to be eminently "a narrative for the reading of the people," at once attractive and trustworthy. It will be sold only by subscription.

The Appletons send us an *Illustrated School History of the World*, by J. D. Quackenbos, M. D. If teachers want the history of the world from the earliest ages to our own time, condensed into a duodecimo of 472 pages of large, clear type, this volume will answer their purpose. The work seems carefully done, and the mechanical execution of the book is excellent.

The same publishers reprint Marcel's *Rational Method for Learning French*, which dispenses with both grammar and dictionary. The little book will interest every teacher of French, even if he does not adopt the method. Like Prendergast's, it would doubtless work well if the author's directions were exactly followed.

A Romance of Perfume Lands, or the Search for Captain Jacob Cole, written and published by F. S. Clifford, 23 School Street, Boston, is rather in the vein of Jules Verne's combinations of fiction and science. It gives an account of all the leading perfumes, their origin and preparation, and as it is written by an "expert," the information can be depended upon as accurate. This is woven into a narrative, which, though it may not claim the highest rank as a work of fiction, is well told, and is unexceptionable in sentiment and tone. It is copiously illustrated, and is in all respects a handsome book

Roberts Brothers have added Hamerton's *Round my House* to their neat edition of the works of this popular author. It is made up of "notes of rural life in France in peace and war," and has all the charm of that delightful book, "A Painter's Camp." Its descriptions of scenery and life show the keen eye of the artist and the pen of the ready writer. We can name no book that gives one so vivid and truthful an idea of rural French life and character.

The Flower and Vegetable Garden is a useful manual, published by Mr. J. Vick, the well-known Rochester florist. It contains a great deal of practical information, with many colored and other illustrations, and is sent postpaid at the low price of 35 cents, in paper covers, or bound in cloth for 65 cents.

Besides the exquisite little edition of Hawthorne, the latest issues in which are *Our Old Home* and the *English Note-Books* (the latter in two volumes), Osgood & Co. are publishing what they call the "Vest-Pocket Series" These books are sold for half a dollar each, and, though even smaller than the "Little Classics," are in the same large, clear type. Among those already issued are two filled with Emerson's earlier essays, *Power, Wealth, Etc.*, and *Culture, Beauty, Etc.* Longfellow's *Miles Standish* and Fields's *Hawthorne* are others; and so on. The series is likely to be very popular, and elsewhere we have given what we believe to be the secret of its success.

Emerson's *Letters and Social Aims* (Osgood) contains eleven essays, now first collected into a volume. The subjects are Poetry and Imagination, Social Aims, Eloquence, Resources, The Comic, Quotation and Originality, Progress of Culture, Persian Poetry, Inspiration, Greatness, and Immortality. The appearance of such a book is a notable event in literary history.

A new issue in the "Advanced Science Series" (G. P. Putnam's Sons) is *Electricity and Magnetism*, by Francis Guthrie, professor of physics in the Royal School of Mines. It is a compact summary of the present state of our knowledge on those subjects.

All these new books may be found at Lockwood, Brooks, & Co.'s. They also publish *The Cambridge of* 1776, a volume prepared for the Ladies' Centennial Committee of Cambridge, and printed, illustrated, and bound in quaint old style at the Riverside Press. The contributors are the *élite* of the Cambridge authors, and the book is a unique and choice addition to the growing Centennial literature. A limited edition was published by subscription, but there was such a call for the book, as soon as its merits became known, that another edition has been issued, and we have no doubt that more will yet be wanted. The price is only $1.25, the labor of preparation having been mainly gratuitous.

The *American Architect* has now reached its 8th number and more than keeps the promises of its prospectus. The illustrations are well chosen and well executed, and the reading matter will compare favorably with that of the best foreign journals in the same line. The paper is very cheap at six dollars a year, *with the* JOURNAL, and we commend it to the attention of our friends.

Medicine and Pharmacy.

COD-LIVER OIL.

Among the "new remedies" that are continually being brought forward, there is now and then one that seems, so to speak, to take the medical world by storm. Its value is so marked and indisputable that it does not have to work its way by slow degrees to professional recognition and approval, but it is almost at once promoted to the highest rank as a therapeutical agent. Even before the theory of its action is settled, it may be generally accepted by medical men on the strength of its evidently good results. It is commended by what it *does*, though it be not clearly understood *why* or *how* it does it.

It is in this way that cod-liver oil has established itself in the materia medica of our day. Though not entirely unknown as a remedy at an earlier date, it was only about twenty-five years ago that it began to attract much attention among medical men, and from that time till now it has rapidly risen in both professional and popular favor. There are few remedies whose position is now better assured, or which are more largely used throughout the civilized world. The disorders in which it is of value are concisely stated by Professor Biddle, in the last revised (1874) edition of his "Materia Medica," as follows: —

"In the treatment of phthisis pulmonalis it is now looked upon in Great Britain and the United States as superior to any other agent, and as possessing an undoubted power of arresting the progress of both the general and the local symptoms of the disease. Although efficacious in all the stages of phthisis, its value is most conspicuous in the earlier stages, especially before the formation of true tubercles. Over the different forms of scrofula it exercises also a very decided control — particularly glandular enlargements, ulcers, diseases of the joints and spine, ophthalmia, etc. In the various cutaneous affections, tertiary syphilis, chronic rheumatism and gout, and the entire circle of chronic disorders, in which there is a tendency to marasmus, and where the nutrition is defective, cod-liver oil is employed with benefit."

But what is the secret of its curative value? Some have thought that it lay in the iodine which the oil contains; but this cannot be the case, for it contains actually less and not more iodine than fish, oysters, and other marine products. It has also been suggested that it aids in the formation of some of the constituents of the bile; but this view meets with little favor among physicians and physiologists. The theory upon which they now generally agree is that the value of the oil is due to its being an easily digestible fat of high nutritive value. The London *Practitioner*, for December, 1875, says: —

"Buchheim finds that the oil has an acid reaction, and contains, in addition to the fatty glycerides, free fatty acids (oleic, stearic, and palmitic), the quantities of which vary in the different kinds of oil, but amount in the clear variety to about five per cent. No biliary matters are present in the oil. Its value, according to Buchheim, depends on the presence of the free fatty acids, since the absorption of fats is preceded, to a certain extent, at least, by their disintegration into glycerine and fatty acids, and as the latter are introduced in cod-liver oil in their free condition, and thus easily unite with the alkalies of the intestinal juices to form soluble and easily absorbed soaps and combinations, a part of the digestive work is spared, which is of importance for weak persons with deficient power of producing the gastric juices."

If this view be correct, it is of the utmost importance that the oil should be absolutely pure and perfectly fresh. If it is stale, impure, or adulterated, it ceases to be readily digestible, and is no better than any other fat or oil. As found in the market it varies much in appearance and in quality. The authority already quoted, Professor Biddle, recognizes three varieties, the "*white* or *pale-yellow*, the *brownish-yellow*, and the *dark-brown*." He ascribes this difference in color to the mode of preparation, "the *pale* being prepared from fresh livers, the *dark-brown* from those which are collected at sea and have undergone putrefactive decomposition, and the *brownish-yellow* from those in which putrefaction has only partially commenced." He adds, "The pale oil is the purest; the dark oil is the most offensive to the taste and smell, and the least acceptable to the stomach."

This test of color, so far as it goes, we believe to be a reliable one, and all who have occasion to use the oil should bear it in mind. But since, though of the right color, it may be stale or adulterated with other light-colored oils, it is important to have other assurance of its freshness and purity. Not only should the livers from which it is obtained be fresh, but they should be taken at the proper season of the year, and the extraction of the oil should be conducted with the nicest regard to temperature, and with extreme care and cleanliness in the manipulation. The entire process must be in the hands of persons who are both skilful and faithful, and the quality of the product should be guaranteed by responsible and reliable parties. Cod-liver oil thus prepared and thus indorsed will never disappoint the expectations of those who prescribe or use it.

Our space does not permit any extended reference to the combinations of the oil with other medicinal agents, which have been tested and approved by physicians. Perhaps the most important of these is its association with the hypophosphites, which have been so extensively used in pulmonary and nervous disorders. United, the two agents have proved in many cases far more efficient than either by itself. Whether the hypophosphites, as many hold, are useful in directly furnishing the phosphoric element required by the nervous system, or, as others believe, act by stimulating cell-growth and nutrition, they are equally potent allies of the oil in many of the disorders for which, as already stated, it is found valuable.

THERAPEUTICAL USE OF SALICYLIC ACID.

We have received several inquiries from our medical patrons for further information concerning the employment of salicylic acid. The following formulæ and practical hints on the subject are condensed from trustworthy foreign authorities. As an application to granulating surfaces a lotion containing 1 part of acid, 3 of phosphate of soda, and 50 of water has been found useful. As heat and the addition of borax increase its solubility, a clear lotion of considerable strength can thus be obtained: for instance, ten grains of acid can be readily dissolved in an ounce of water by heating and then adding six grains of borax, or even twenty grains of the acid will be taken up by an ounce of water if fourteen grains of borax are added. These solutions, in addition to their use as lotions, may be used as gargles, where an antiseptic and astringent gargle is indicated. To a surface where it can be accurately applied, and where the discharge is slight, the cerate suggested by Professor Lister for rodent ulcer — salicylic taking the place of boracic acid — is an excellent application. The formula is from half a drachm to a drachm of salicylic acid, one drachm of white wax, two drachms of paraffin, and two drachms of almond oil; melt and rub up in a heated mortar. It should be spread on strips of muslin or fine linen.

Another ointment may be made of sperm oil, one drachm and a half; oil of theobroma, five drachms and a half; salicylic acid, from half a drachm to a drachm. This forms a thick paste, which should be thickly spread on lint. The heat of the surface acting on the oil of theobroma, a diffusible ointment is formed, which is a suitable application when it is desired to have the discharge thoroughly saturated with the antiseptic. An ointment less easily acted on by the body-heat consists of sperm oil and paraffin, of each a drachm and a half; oil of theobroma, two drachms; oil of almonds, one drachm; salicylic acid, from half a drachm to a drachm.

A very simple and most useful ointment, and one which answers admirably in some affections of the skin, is formed of half a drachm to a drachm of the acid to seven drachms of simple ointment. A liniment of salicylic acid and olive oil (two drachms of the acid to eight ounces of oil) will be found of much efficacy in burns. Soak lint in the liniment, and apply to the suppurating surface. Professor Will, of Aberdeen, who has tested this in some severe cases of burns, commends it strongly in the *Lancet*.

For cancerous sores Thiersch recommends dusting with the pure acid, or with equal parts of the powder and starch, or powder formed of charcoal, and the acid might be employed for the same purpose, or for dusting over the face of poultices applied to sloughing surfaces.

M. Maury, of Lyons, in a paper on salicylic acid published in the *Répertoire de Pharmacie*, a translation of which appears in the London *Pharmaceutical Journal*, gives a collection of formulæ, from which we select the following: —

Antiseptic Mouth Paste.

Rectified salicylic acid	2	grams	(or parts by weight).	
Honey . .	34	"	"	"

Powder for Extemporaneous Mouth Paste.

Rectified salicylic acid . .	2	grams (or parts).
Powdered sugar, or some other inert powder . . .	120	grams or parts.

Mix. To be applied to the sore parts of the mouth by means of a brush previously moistened with water.

Salicylic Syrup.

Mix pure salicylic acid with sufficient syrup of orange flowers for 20 grams to contain 5 centigrams of the acid (or 400 parts of the former to 1 of the latter).

Mixtures.

(1.) Pure salicylic acid . .	1.5	grams	(or parts).	
Powdered gum arabic . .	10	"	"	
Sugar	10	"	"	
Orange flower water . .	20	"	"	
Distilled water . .	100	"	"	

Shake the bottle before each dose. A teaspoonful every two hours for children.

The following formula is attributed to Professor Wunderlich :—

(2.) Salicylic acid	1 gram	(or part).
Oil of sweet almonds	20 grams	(or parts).
Gum arabic	10 "	"
Syrup of almonds	25 "	"
Orange flower water	45 "	"

A teaspoonful to be taken every hour when children are sufficiently old to use a gargle.

Salicylic Wine.

Pure salicylic acid	2 grams	(or parts).
Muscat wine	100 "	"

OUR DRAINS.

THE *London Builder*, under this title, gives the following spirited example of sanitary poetry, which unfortunately is as apropos in some of our American cities as it is in those of England : —

Our drains! our drains! our foul, leaking drains!
They poison the air of our streets and our lanes,
In city and suburb, in hamlet and town,
'Neath dwellings and workshops, wherever laid down.
Can reason still fail young and old to convince
That sewer-gas slaughters both peasant and prince?
How can we have health if the blood in our veins
Is poisoned by breathing foul air from the drains?

Our drains! our drains! our badly made drains!
That give out their smells ere and after it rains,
Sickening the robust man walking the flags,
Prostrating the half-nourished worker in rags,
Swift-stealing through panels where fashion and rank
Sit proudly on cushions, in drives from the bank.
But headache and faintness and death-boding pains
Go home in the carriage to tell of the drains.

Our drains! our drains! our death-dealing drains!
Choked up, with no outlet for rotten remains,
Chronic hotbeds of typhoid, full of foul silt,
Reflecting our ignorance, proving our guilt,
And showing that we have been riding rough-shod
O'er Nature, and morals, and maxims of God.
For pure air and water in cities and plains,
Spell health, if we keep right our dwellings and drains.

A "SURE CURE" FOR RHEUMATISM.

THE number of "infallible" cures for rheumatism that have been announced has become a matter of joke. Our readers have doubtless seen the amusing list of a hundred or so of these specifics, professional and non-professional, that has gone the rounds of the papers. Dr. Franz Heller has added one more to the catalogue, and that is *ammonia*, which he advocates enthusiastically in the *Medizinische Presse*, of Vienna. For several years he had been a sufferer from severe muscular rheumatism in the right shoulder; he had taken all the common anti-rheumatic remedies with but little alleviation, when he began to reason that in rheumatism, as in gout, there may be a uric acid diathesis; he thought that liquor ammoniæ, on account of its rapid volatilization, would be the remedy most readily absorbed, and the most prompt in action. He took one drop, diluted with water, and felt immediately a complete relief from the pain, which had lasted for ten hours; he was now able to move freely the arm which, an instant before, he could scarcely bear to have touched. The remedy, he claims, has proved a positive cure in all recent cases of muscular rheumatism which have fallen under his observation, and these have been many.

He also observed its effects in several cases of acute articular rheumatism, in two of which six drops sufficed to subdue the pain and swelling within a period of twenty-four hours.

In one case of chronic rheumatism of a finger-joint, which had lasted for over half a year, the simple administration of the ammonia completely dispelled the inflammation and pain in the joint within two days.

Of the mode of action of this remedy he says : —

"If we consider an excessive acidity as the cause of the rheumatism, we can scarcely claim, in the cases in which one drop will instantaneously relieve the pain in recent rheumatism, that one drop was sufficient to counteract the effects of the excess of uric or (according to Fuller) lactic acid. Nothing remains, therefore, but for us to seek for the source of rheumatism in a morbid nervous activity induced by disturbances of nutrition, and to believe that the ammonia acts as a nervine directly upon the nerves."

After the cure of one attack of rheumatism, our object should be to put the patient in such a condition as to prevent its recurrence. This, Dr. Heller thinks, can be done by building up the general system, and thus diminishing the nervous excitability.

CHLORAL AS A LOCAL APPLICATION TO ULCERS.

A WRITER in the *London Lancet* says : —

On visiting the wards of Guy's Hospital, we saw several patients on whom a solution of hydrate of chloral had been used as a local application to ulcers, and the results appeared to be sufficiently satisfactory to be worthy of record. Mr. Lucas commenced the use of chloral among his out-patients in August last, for cases of sloughing wounds and fetid ulcers, and, being pleased with the result, he has since given it a somewhat extensive trial in the wards. The effect of the local application of chloral appears to be that of a powerful stimulant and disinfectant; it has no soothing or sedative effect upon the part to which it is applied, but on the contrary gives rise to considerable pain, which lasts some time; nor does it, even when used over a very extensive surface, ever become absorbed in sufficient quantity to act as a hypnotic. Whether it is taken up into the circulation or not matters little, since the quantity used as a local application is so small, compared with the dose administered as an internal remedy, that were the whole of the drug applied to find its way into the blood, the quantity absorbed would still be very much less than that of an ordinary sleeping draught. Its local application is, therefore, eminently safe and free from the dangers which sometimes follow the use of opium lotion or carbolic lotions long continued. Mr. Lucas has used solutions of various strengths, that which he has found most useful being a solution of four grains of hydrate of chloral in an ounce of water. The application of a lotion of this strength is, as we have just stated, often attended with considerable smarting, which may last a quarter of an hour, but the smarting becomes less at each subsequent application. In cases where the patients have complained much of the smarting, the lotion has been diluted to the proportion of three or two grains to the ounce. The treatment of foul sloughing ulcers by means of chloral lotion has been attended with great success, the surface of the sore quickly cleansing and assuming a healthy appearance, whilst the subsequent healing has advanced with a rapidity in some cases quite astonishing.

NOTES FROM ABROAD.

A MADMEN'S BALL. — The *London Medical Times* reports a ball at Hanwell Lunatic Asylum on New Year's Eve. Dancing commenced at six o'clock, in the ball-room, which was brilliantly lighted and gayly decorated for the occasion. It was very interesting to see four or five hundred persons of "unsound mind" all congregated together and enjoying the dancing either as spectators or executants. The accuracy with which the various dances were gone through was surprising, and save for a slight occasional outburst of excitement on the part of one of the patients, one would scarcely have believed that a large proportion of the company were confirmed lunatics. The proficiency of the patients in dancing may be explained by the fact that certain of them are allowed to practise in the ball-room every Monday evening during the winter months. At eight o'clock dancing was suspended for refreshments, the women being regaled with spiced ale, cake, and other light refreshments, whilst the men sat down to a hot meat supper which had been laid in the dining-hall. Supper ended, the men were each provided with a pipe of tobacco and an extra mug of ale, which they seemed thoroughly to enjoy. A few comic songs were then sung by some of the patients, after which dancing was resumed, and kept up until nearly eleven o'clock. All the proceedings of the day and evening passed off without the slightest unpleasant incident.

FASHION AND NEURALGIA. — A physician of a London hospital, writing to the *British Medical Journal*, remarks on the increase of neuralgia in the face and head of females compared with the amount of the disease found in the male sex, and says : —

"There is no doubt that it is one of the most common of female maladies — one of the most painful and difficult of treatment. It is also a cause of much mental depression, and leads more often to habits of intemperance than any other. This growing prevalence of neuralgia may to some extent be referred to the effects of cold upon the terminal branches of the nerves distributed to the skin; and the reason why men are less subject to it than women may to a great extent, I think, be explained by the much greater protection afforded by the mode in which the former cover their heads when they are in the open air. It may be observed that the surface of the head which is actually covered in man is at least three times that which fashion allows to a woman; indeed, the points of contact between the hat or bonnet and the head in the latter are so irregular as practically to destroy any protection which might otherwise be afforded. If I were to report to the journal a case of facial neuralgia cured on the principle of protecting the lateral and frontal surface of the face, as well as the superior part of the scalp, it might excite a certain amount of ridicule. I can assure you, however, that my patient considers that her case ought to be reported; for she says that, if we cannot do much for neuralgia with our prescriptions, we ought to oppose fashion when we find it prejudicial to health and productive of suffering."

Women are without doubt the slaves to fashion, but if the ridiculous custom of wearing a make-believe bonnet or hat, a mere frame on which to stick a few feathers and ribbons, is the cause of neuralgia, with all its more serious results, it is time that a more suitable head-covering should be invented.

POISONING BY CHLORAL. — There is an interesting account in the *British Medical Journal*, by Dr. David Young, of Florence, of a case of poisoning by chloral hydrate. A gentleman took a whole mixture containing three drachms of the salt, instead of the sixth part, as ordered. He was in a condition approaching lifelessness when the doctor arrived, but by the prompt application of hot-water bags and bottles to the stomach and other parts of the body, wrapping the legs in warm flannel, and, when the heart began to regain its power, the administration of extract of meat with a little brandy, the patient was at last completely restored.

EFFECT OF ACID VAPORS ON HEALTH. — Dr. Angus Smith, in his eleventh annual report of proceedings under the Alkali Acts, just issued in England, gives some interesting information upon the

influence of acid vapors on health. Among other observations, he says it may be taken for granted that where trees flourish, there also man is uninjured by acids such as are given out by chemical works, the effect upon vegetation being more striking than upon human beings. The general conclusion is that gases from chemical works are hurtful to the health; nor can they, on the other hand, be said to be curative in certain diseases, as so many suppose. In collating the statistics of a district peculiarly exposed to the fumes from alkali works, Dr. Smith was struck with the following points: 1. That bronchitis was not high. 2. That scarlet fever, which gases might be supposed to disinfect, was very high; whilst whooping-cough, often thought to be benefited by the fumes, was low.

Cotton-Wool for Surgical Dressings. — At the last sitting of the Paris Academy of Medicine the question of cotton-wool for surgical dressings was again debated, with the result of showing the beneficial effects of that mode of dressing. Both Professor Gosselin and M. Alphonse Guérin spoke most highly of the good results they had obtained. They were not agreed, however, as to the cause of the excellent properties of wadding applied to wounded surfaces, M. Guérin believing that it was due to the interception of germs by the cotton-wool, and M. Gosselin referring it to the warm, even, comfortable temperature kept up by the cotton-wool.

New Fact in Aural Physiology. — Herr Urbantschitch, in a German medical journal, calls attention to the fact that if a watch be held at a little distance from the ear, the ticking is not heard uniformly, but there is a swelling and diminishing of the sound. If held at such a distance as to be scarcely audible, the ticking will come and go, being at times perceived distinctly, but at times becoming wholly inaudible; as if the watch were being moved to and from the ear. This variation in perception is not always gradual; it is sometimes sudden. The same holds good for other weak sounds, as that of a weak water jet, or a tuning-fork. Since breathing and pulsation have not the least influence on the phenomenon, the interruptions of the sensation must be attributed to the organ of hearing itself; our ear is unable to feel weak acoustic stimuli uniformly, but has varying times of fatigue. To decide finally where the seat of the peculiarity lay, M. Urbantschitch made both ear-passages air-tight and applied a tuning-fork and a watch to the head. The sounds seemed not continuous but intermittent. The cause must therefore be in the nerves of hearing.

Chloride of Lead as a Deodorizer. — Dr. Goolden, in the *London Lancet*, calls attention to the great value of chloride of lead as a deodorizer. He prepares it by dissolving half a drachm of nitrate of lead in a pint or more of boiling water, and pouring the solution into a bucket of water in which two drachms of chloride of sodium have been dissolved. When the sediment has subsided, the clear supernatant fluid is a saturated solution of chloride of lead. Dr. Goolden says that a cloth dipped in this solution, and hung up in a room, will instantaneously sweeten a fœtid atmosphere, or if the solution be thrown down a sink, water-closet, or drain, or over a heap of dung or refuse, a like result will ensue. In this way he disinfected a house into which a drain had burst, some stables, and also a large ship. In the last case the bilge-water was exceedingly offensive. He merely dissolved half an ounce of nitrate of lead in a bucket of boiling fresh water and had it thrown down the bilge when the ship was rolling slightly. The effect was the instant disappearance of all smell.

FACETIÆ.

Vaccine "Humors." — The story is told of a rural physician who, on receiving a sample lot of animal virus on quills, supposed them to be toothpicks, and employed them accordingly.

During a recent discussion on vaccination, it was stated that a druggist who deals in vaccine matter had some returned to him recently with a letter from the physician stating that he had tried it, and it had failed in every instance. On examination it was found that he had merely chipped off a small amount of the wax covering, but had not even reached the tin-foil surrounding the crusts.

Another doctor boils his quill points thoroughly before using them, and then thinks "they are not so reliable as crusts taken from healthy children."

Mace and Nutmegs. — Most of our readers doubtless know that the nutmeg, like all other spice, grows in tropical countries. The fruit of the nutmeg-tree, especially as it approaches maturity, is very like a large yellow peach. At maturity the outer hull opens, and if not gathered the valuable product would soon fall to the ground. The mace is the second coat which covers the nutmeg, and almost envelops the dark, impervious hull, or third covering of the nutmeg. When the product is gathered the mace is of a deep red color, and is taken carefully from the hull which still incloses the nut. Then the hull is broken and the nut taken out, when it is ready for market.

In the palmy days of the "Hon. East India Company," all the company's possessions were governed by twenty-four gentlemen in London, called the "Hon. Court of Directors," who had spent their lives from early manhood to middle age in India, were usually the company's most distinguished civil and military servants, and were supposed to know everything pertaining to the interests of the great corporation. They superintended the sale of all Indian products, and, finding at one period that the mace sold more readily than the nutmeg, they wrote to the government in India to *cultivate more of the mace and less of the nut!*

A Homœopathic Soirée. — A correspondent of the Birmingham (Eng.) *Daily Mail*, after referring jocosely to a recent ball of the chemists and druggists in that city, adds: "The homœopathic chemists of the district intend to hold a *soirée* on their own account in the back parlor of the chief homœopathic pharmacy in the town. During the evening, Professor Belladonna will deliver a lecture on 'The Use of the Globules,' and many interesting homœopathic specimens will be exhibited; among others, 'A Working Man's Wages, as received by his Wife,' 'The Brains of a Kenealyite' and those of a 'Girl of the Period,' and other comminuted objects. Jujubes will be provided, and the floor will be laid with a perfectly new poor man's plaster."

SELECT FORMULÆ.

Emulsions of Cod-Liver Oil. — The *Druggist's Circular* says that an emulsion with yolk of egg may be made as follows: —

Cod-liver oil	4 ounces.
Yolk of egg,	No. 1
Simple syrup	2 "
Water	14 "

Rub the oil with the yolk of egg, and when they are intimately mixed, add gradually the water first, and lastly the syrup. The emulsion may be flavored with oil of bitter almonds or tincture of nutmegs. Instead of syrup and water, a good vehicle is an equal quantity of sherry wine, which at the same time insures the keeping of the mixture. In pharmacies where emulsion of cod-liver oil is frequently prescribed, a good plan is to keep on hand a mixture of glycerine and yolk of egg, named *glyconin*, as recommended by Mr. G. C. Close. It is made by mixing five parts by weight of concentrated glycerine with four yolks of eggs previously well beaten. The mixture is said to keep almost indefinitely; it may be made in quantities when eggs are abundant, and its use saves the trouble of sending out for eggs at times when they can, perhaps, be had only with great difficulty.

The *emulsion with glyconin* is made thus: —

Cod-liver oil	4 ounces.
Glyconin	9 drachms.
Sherry wine (or syrup and water.)	16 ounces.

The manipulation is similar to that given above.

Liquid Pepsin. — This is prepared from the solid pepsin as follows: —

Saccharated pepsin	64 grains.
Water	5 fluid ounces.
Muriatic acid	1 fluid drachm.
Glycerine	3 fluid ounces.

Shake the pepsin, the water, and the acid in a bottle until all is completely dissolved; add the glycerine, and filter. Each fluid ounce of the liquid should dissolve one and a half drachms of coagulated albumen.

Almond Tablets. — Reduce 4 ozs. blanched almonds to a smooth paste by long-continued heating in a clean marble mortar; with this incorporate the white of an egg; then warm the mortar and add to the mixture 3 ozs. almond oil, in which 1 oz. white wax and ½ oz. spermaceti have previously been dissolved; stir and mix thoroughly, adding some otto of rose or neroli, according to fancy, and when nearly cold pour into moulds.

Collodion for Freckles. — The *Bulletin Général de Thérapeutique* says that a solution of corrosive sublimate, either pure or mixed with cyanide of mercury, is commonly employed for the removal of freckles; but a collodion containing ten per cent. of its weight of sulpho-carbolate of zinc has given excellent results without being accompanied by any of the dangers attending the use of the mercurial solution. The following formula is an excellent one: —

Sulpho-carbolate of zinc	1 part.
Collodion	45 parts.
Oil of lemon	1 part.
Absolute alcohol	5 parts.

The sulpho-carbolate of zinc should be reduced to an extremely fine powder, and should then be thoroughly incorporated with the fluid mixture.

A Good, Paying Drug Business for Sale. — Desirable unencumbered Western city property would be taken in exchange. Address "The Drug Store," Thayer, Neosho County, Kansas.

For Sale. — A Physician's Practice, Drug Store, and Dwelling for Sale, in a Thriving Village, with good surrounding country, 20 miles from Philadelphia. A chance seldom offered. Good reasons for selling, and full particulars given by addressing J. S. Waggoner, M. D., Lock Box 58, Bridgeport, Gloucester County, N. J.

For Sale. — The Stock, Buildings, etc., of a Drug Store, now doing a successful Business. Central Location, the oldest Stand in a City which is one of the most flourishing in the South. Climate unsurpassed. No epidemics of any kind. For particulars, address "Drugs," care Journal Chemistry, Boston, Mass.

BACK NUMBERS WANTED.

Numbers 1, 2, 3, and 4 of Vol. VII., dated July, August, September, and October, 1872, of Boston Journal of Chemistry. Must be in good order. Address, giving price, David E. Mishler, Mogadore, Summit Co., Ohio.

TO PHYSICIANS.

For Sale. — Medical Office. Well located, old established, nicely furnished, and doing a first-rate business. Earnings in 1875, $5000. No bonus required. Tip-top opening for any one. Reason for selling, other business. For particulars, address
Toledo, Ohio. Dr. J. B. WILFORD.

The Strap File and Binder, made by R. G. Hutchinson, 44 Maiden Lane, N. Y, possesses the following advantages over all others: It preserves the papers neatly and perfectly, as no holes are punched in them; it will always lie flat open, even when full, and allows any one or more papers to be at once removed without in any way disturbing those that remain. They are of various sizes, and hold from 26 to 52 papers. Write for catalogue and prices.

Lynn, Mass., *February* 4, 1876.
To the Waverley Butter Co., *Charlestown, Mass.*
This is to certify that I have used the Cream-Suet Butter for two years with perfect success in making cake, pastry, etc., and consider it equal to the best quality of butter.
Yours Respectfully, William Griffen, Baker.
See advertisement of the Waverley Butter Co., on opposite page.

Two New and Popular Varieties of Fine Toilet Soaps have been recently introduced by the Indexical Soap Co., Boston. They are branded "Almond Meal," and "Rice Flour," and possess the softening and whitening properties of these substances, in combination with the best quality of soap, all elegantly perfumed and nicely put up. The high standard of Messrs. Robinson Bros. & Co. will be fully maintained by these new soaps, which, on account of their many advantages, are destined to have a large sale throughout the country.

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Familiar Science.

KITCHEN MANAGEMENT IN FRANCE.

IN these "hard times," if anything can be done to lessen the burdens of life, if any suggestions can be made which will afford hope and aid to those who are struggling to furnish food to dependent families, now is surely the time to act or make suggestions. There are more families in this country who retire to their beds at night without knowing how or where the food can be obtained necessary for their sustenance the succeeding day, than most well-to-do people suppose. Anxieties of this nature are not confined strictly to very poor people; there are many fathers and mothers who earn a considerable sum each day by their labor, who maintain a respectable appearance in their homes and upon the street, but who feel that they do not have an adequate supply of food for their families.

The sufferings of a large number of these people are due directly to a kind of ignorance or improvidence in the management of kitchen affairs. The food which indigent fathers furnish to their households is not selected with intelligent care, and it is not properly economized in cooking. The French people understand household economy much better than we do, and although the French peasantry are poor, they manage to live quite comfortably, and secure at very small cost sufficient nutrition for their physical wants. Though the French generally live very cheaply, though with few exceptions their outlay is within their incomes, though they do without what they think they ought not to pay for, they do not suffer as we do in this country from this want of money, because they possess the priceless faculty of making the best of what they have. This capacity extends to almost every detail of home organization, but it comes out with conspicuous distinctness in their management of food.

No more interesting or profitable investigations have we ever made among any people, than those which relate to kitchen management in France. The tourist has no difficulty in gaining access to the homes of the most lowly, and everything is open to inspection. It used to be the custom in that country, when the traveller alighted at any little wayside inn, to show him the kitchen and larder before opening the bed-chambers for inspection. In 1855–56, a period when there were fewer railroads than now, we journeyed leisurely through France, and obtained views of interior life which are not easily forgotten. From these observations we unhesitatingly declare that the eating in middle-class French houses, inexpensive as it is, is certainly far superior to that of the majority of the richer classes in this country. It consists of few dishes, of smaller quantities; it is composed of low-priced articles, and reference is had to the amount of nutriment secured. The French are too poor and too wise to waste money in the purchase of fish, flesh, or fowl, when these cost more than their nutrient and current values. They study the markets, and select such foods as are sold at reasonable rates and furnish muscular and nerve strength. And then, there are none so poor or saving as not to require that each dish shall be itself, with its full aroma, its full essence, — every particle of nutriment made available. Poverty in that remarkable country does not prevent the exercise of culinary skill; it sets the latter off against the former, it replaces money by intelligence. Every housewife spends the money allotted to the purchase of foods in a way to produce its utmost value, not only in quantity and quality, but, what is even more important, in suitability. The provisions are bought with reference to the use which is to be made of them, and no more than is needed in twenty-four hours is purchased at one time. A French woman knows that a cheap chicken will serve for boiling, and the water is invariably made into a nice soup with vegetables. A better fowl would be selected for roasting, especially if guests are expected. Cabbage, asparagus, and artichokes are more nutritious than potatoes, and therefore they are oftener seen upon the tables of the French peasantry. Dark bread, made from whole wheat and barley, is the only kind used, and eggs, which are usually cheap, are largely consumed. Scarcely any butter or cheese find their way to the tables of the poorer classes; they are too costly.

Everything is eaten up clean, and each morsel of nutriment is extracted. The bones of animals and fowls are broken, and the marrow forms the basis of the excellent soups, so common everywhere. Upon the table there is usually just enough for the family; so no one has a chance of leaving hardly a crumb. Waste is suppressed, because it cannot exist without a surplus, because its very possibility depends on an excess of supply over consumption. From experience and observation the French housewife knows how much weight of food she requires at each meal, and she provides that and no more. If at dinner there is more provided than is absolutely needed, it is known that the evening meal will be lessened in consequence. The peculiar economy of the French is manifested in the purchase of the cheaper articles of food. In the cities the cheaper portions of the meat of animals find a readier market than the dearer, and it often happens that the best or choicest cuts remain upon the market-man's hands until a late hour in the day, and are then sold at reduced prices. A large piece of meat is rarely seen upon the tables of even the richer classes in France; the portion is usually small, and the meal is supplemented with a fair allowance of soup, bread, and vegetables. This management does not lessen the attractiveness of meals, or indicate unpleasant parsimony. Small dishes of each sort of food, cooked in savory and palatable form, enable French housekeepers to economize on the dearer articles, and herein we should learn from them an important lesson.

Another matter connected with French kitchen management claims attention, the great economy of fuel. It is a prominent maxim that a small dish requires but a small amount of fuel to cook it, and a pint or quart of charcoal will do more work in a French kitchen than ten pounds of anthracite will in ours. Cookery is carried on almost exclusively with wood or charcoal fires, kept down to a low smoulder when not needed for the moment, and roused up to activity in five minutes when the time comes to use them. The same exact adaptation of means to ends is discovered here as in all other details of the subject: a fire to roast a chicken is made just big enough to serve the purpose; the combustion of a cent's worth of charcoal boils or stews the contents of two saucepans at the same time; as soon as the operation is complete, the fire is covered up with ashes, or put out. Small quantities do not take so long to cook as large ones, so they need heat for a shorter period; and even in the case of soups which require hours of gentle simmering to bring them to the point, the very nature of the process prohibits strong flame and its accompanying loss of fuel. In cities, Paris particularly, families have their cooking done at cook-shops, of which there are many in almost every street. A housekeeper goes to market in the morning and purchases a joint of beef, or a fowl. It will cost perhaps four centimes to cook this at home, at the cook-shop it can be roasted for half that sum; so it goes to the shop, and at the hour specified it is returned in fine condition. One of the sights of Paris to a stranger is these cook-shops at about the hour of twelve, when the whole establishment is aglow with flame and permeated with the odors of cooking flesh. They are usually open to the

street, and one can look in and see the work done in all its details.

It does not cost a poor man in France one half as much to cook a meal as it does in this country, and fuel of every kind is much dearer. Our big stoves and cooking ranges are in constant blast summer and winter, and there is a prodigious waste of fuel. The same amount of coal is consumed to boil a tea-kettle as is used to roast a sheep. We have not yet learned the first principles of economy as regards either the purchase and use of foods or the consumption of fuel. We are the most wasteful people that now exist, or perhaps have ever existed, and the waste in the poorer class of families is sufficient to sustain in perfect health an equal number of families of the same class in France.

The "waste-buckets" belonging to French families present a very different appearance from those found at the kitchen doors in this country. A French gentleman once observed to the writer that the Americans were a wicked people, as shown by their peculations, murders, drinking-habits, thefts, etc.; but in nothing was the wickedness more distinctly indicated than in the contents of the "waste-carts" as noticed in the streets of our cities. A people addicted to such wanton waste ought to suffer from protracted famine, or some calamity which would teach lessons of economy in the use of food materials.

We should learn from the French housekeepers and cooks several useful lessons. First, as regards the selection of articles of food by those of limited means, it may be said that good bread is indispensable in families, and to secure this, it is not necessary to purchase the whitest and highest-priced flour. The middle and poorer classes in France use but little white flour; they have learned that the sweetest and most nutritious bread is made from wheat, barley, and rye, ground finely but unbolted. Their bread is dark, but of excellent quality. Meats should be selected with a view to the methods of cooking to be adopted. The French never *boil* meats unless for the purpose of making soups. They regard boiled meats as comparatively worthless, and never serve them unless in some prepared form, to restore flavor and lost nutrient principles. We forget in this country that to *boil* food, be it meat or be it vegetables, is to extract from it, first, its volatile aroma, then its essences or juices, its nutritive power; and these go out into the hot water, which is stupidly thrown away. Boiling meat or vegetables in France is to make soup, and so saving are they, that even the water in which beans and cauliflowers have been boiled is always kept to serve as a basis for vegetable soup. Every liquid which has received the extracted flavor of a boiled substance is looked upon as precious, and is employed again in some form, so as not to waste the properties which it has acquired. The entire system of French cooking, both in form and practice, is to save the whole nutritive elements of every substance, to pass into the stomach, instead of allowing it to be poured down the sink-spout or sending it to the pigs. The lesson taught us in this regard should be heeded. Butchers' bones, and those of fowls, which here go to the waste-bucket or to the soap-boiler covered with fragments of meat, and loaded internally with rich suet, are in France carefully sought for and employed in making soups. Nothing is wasted which can be used for human food; soups are so common, it may be said the nation lives on them. The average earnings of laborers in France do not exceed thirty cents a day, and yet from this pittance they continue to live comfortably. The average of health in the population is much higher than in most countries, and the average length of life is as high as thirty-eight years.

The French acquire their art of providing and cooking from example and habit. The skill is handed down from one generation to another, each generation adding its own improvements. Among the professional cooks there exists a marvellous skill of combination and change. They cook eggs in one hundred and twelve different ways; they have more than three hundred sorts of puddings and sweetmeats, fifty methods of cooking beef and mutton, eighty of fowls. Among the rich classes, the same dishes are not used oftener than once in three or four weeks, so great is the variety. One would suppose their dishes would disorder the stomach, but dyspepsia is a rare disease in France. Altogether, the French are an extraordinary people, and when their habits and methods of living are understood we cease to wonder at their health and great wealth.

MEASURING EARTHQUAKES.

THERE is scarcely any movement or change in nature which modern science does not measure. No matter how great or how small the phenomena may be, some instrument is devised for gauging and registering them. The vocabulary of science fairly bristles with strange polysyllabic names ending in *meter*, which have been formed as designations of these ingenious contrivances. Meteorology has its thermometers and barometers, and scores of less familiar hygrometers, pluviometers, anemometers, and so on; and every other branch of physical science can show a similar catalogue.

The *seismometer* is a measuring machine of which some of our readers may never have heard. The word is derived from the Greek σεισμός (*seismos*, a shaking), and means an earthquake-measurer; for the physicist applies his gauges even to earthquakes. There is an instrument, known as the sphygmograph, by which the heart is made to record in expressive curves the force, rapidity, and other characteristics of its beating. The seismometer measures the heart-throbs of mother Earth, and registers every pulsation that thrills her mighty frame. Of course it is only in certain localities that this can be done, just as it is only to certain parts of the body that the sphygmograph can be applied. One of these localities is the observatory on Mt. Vesuvius, of which Professor Palmieri is the director.

This observatory is situated on a spur of the mountain, close to the Hermitage, or half-way house on the route usually taken by ascending tourists. The seismometers are in the second story of the building, but rest upon solid piers of stone reaching to the earth. The instrument for the automatic registration of vertical shocks is a fine metallic point, suspended by a coil of wire just over the surface of a cup of mercury. The slightest upward motion of the earth carries the mercury up to the wire, completing a galvanic circuit which instantly stops a clock and rings a bell to notify the observer to reset the apparatus and observe future phenomena. To measure the intensity of vertical shocks, small magnets are suspended over a cup of iron-filings by means of coils of wire of different strengths. When a vertical shock occurs, some of these magnets dip into the iron-filings, and to one of them a light index is attached for measuring the intensity of the shock. For horizontal shocks the registering apparatus consists of U-shaped glass tubes, partially filled with mercury, and set to the four cardinal points. A small weight rests on the mercury and is attached to a silk fibre, which runs over an ivory pulley and has a counterpoise at the other end. On each pulley there is an index and circular scale to mark the angle through which it turns. A horizontal shock causes the mercury to rise in the tube or tubes corresponding to the direction from which it comes, the weight is raised and the pulley marks, by means of the index, the angle through which it has turned. At the same time the mercury in rising completes a galvanic circuit which stops a clock and rings a bell. The galvanic current from either registering apparatus also starts another clock, the pendulum of which has hitherto been held out of perpendicular, and this clock allows a roll of paper to be unwound, on which, by means of electricity, a pencil traces the movement of future shocks, the spaces between the markings indicating the time elapsing between the shocks.

Professor Palmieri, who has the charge of these seismometers and all the other apparatus of the observatory, is not only an eminent physicist, but a brave man. He has remained at his post when Vesuvius was in active eruption, calmly watching the indications of his instruments, amid the elemental warfare, cool as a veteran under fire, though like him really in peril of his life and fully conscious of the danger. We trust that it may not be his fate to fall a victim to his devotion to science, as the elder Pliny did in an eruption of the same Vesuvius eighteen centuries ago.

CHECKING THE FIRE-FIEND.

THE amount of worry and anxiety and consequent discomfort of living, and the shortening of the term of life, caused by the apprehension of danger from fire is enough to make every one search diligently for safeguards. The danger of loss of property is of course very great, and even the moderate chance of loss of life should not be disregarded.

When the communists tried to burn Paris, they failed, not because the fires were put out by engines of any kind, but because the city was so built that it *would not burn*. What must be the fate of an American city under similar circumstances is easily foretold. We build fire-traps, and we protect them by insurance. But money, though a great soother at times, can never pay us for loss of peace of mind. It cannot even pay us for the loss of those articles of daily use to which we have become attached by long association: the many pictures and books which seem to us like old friends, and, far dearer than these, the mother's "old arm-chair" or the dead child's playthings. We cannot reconcile ourselves to the loss of these, and we all long at times for a home in which they can be made reasonably secure to us. We do not ask for absolute safety. The world can seldom give that. We ask to have our treacherous enemy checked and retarded, to

give time, at least, to get our priceless treasures beyond his reach.

Much has been said and written on fire-proof construction, and most of it ends with advice to employ cumbersome and expensive work of iron, brick, and tiles. But little has been told to show how a comparatively cheap house can be built so that it will never burn quickly, and so that the chances of saving it altogether can be increased a hundred-fold.

Before showing how this can be done it may be well to transcribe, for the benefit of those whose houses are already built, a few suggestions from the London *Builder* with reference to the prevention of fires.

"Keep matches in metal boxes, and out of the reach of children; wax matches are particularly dangerous, and should be kept out of the way of rats and mice. Be careful in making fires with shavings and other light kindlings. Do not deposit ashes in a wooden vessel, and be sure that burning cinders are extinguished before they are deposited. Never put firewood upon the stove to dry, and never put ashes or a light under a staircase. Fill fluid or spirit (or kerosene) lamps only by daylight, and never near a fire or light. Do not leave a candle burning on a bureau or chest. Always be cautious about extinguishing matches or other lighters before throwing them away. Never throw a cigar stump upon the floor, or into a spit-box containing sawdust or trash, without being certain that it contains no fire. After blowing out a candle, never put it away until sure that the snuff has gone entirely out. A lighted candle ought not to be stuck up against a frame wall, or placed upon any portion of the wood-work in a stable, manufactory, shop, or any other place. Never enter a barn or stable at night with an uncovered light. Never take an open light to examine a gas-meter. Do not put gas or other lights near curtains. Never take a light into a closet. Do not read in bed, either by candle or lamplight.

"The principal register of a furnace should always be fastened open. Stove-pipes should be at least 4 inches from wood-work, and well guarded by tin or zinc; rags ought never to be stuffed into stove-pipe holes; openings into chimney-flues for stove-pipes which are not used ought always to be securely protected by metallic coverings. Never close up a place of business in the evening without looking well to the extinguishment of lights and the proper security of the fires. When retiring to bed at night, always see that there is no danger from your fires, and be sure that your lights are safe."

To these good rules might be added: Never keep or leave oiled rags or oiled cotton waste in any place where their burning could do any harm. They are more dangerous than gunpowder. Always have an axe, one or more buckets of water, and a small hand-pump available at all times to put out a fire in its beginning. Don't allow accumulations of combustible rubbish about, especially in out-of-the-way corners.

These directions may prove of use to those whose houses are already built. Those who have yet to build need to be shown how to use their materials properly. The great danger in our present system of construction lies in the inflammable nature of our building materials, and in the opportunity given by the arrangement of partitions and walls for the fire to spread through partitions, walls, and floors unchecked, unseen, and out of reach. It is best, if possible, to build outer walls of brick, and with judicious treatment and at moderate expense they can be made to look attractive even in the country. By making a projection or offset inside at each floor an effectual stop can be put to any passage of fire up the inside surfaces; or if hollow or vaulted walls are used, the plaster can be put directly on the brick without using any wood. But if the outside walls are of wood, the spread of fire can be greatly checked by filling them full between the joists and against the outside boarding with brick and mortar or concrete, or any such incombustible material; or, if the expense is too great, they may be filled in at each floor, and for a short distance above. Then, by treating the partitions in the same way, there will be an unobstructed channel or flue for flame only one story high, and stopped tight at top and bottom. The wood will hold well and burn very slowly, even when only partially protected in this way. In war-times soldiers used to build chimneys with a cob-house construction, of small sticks plastered inside and out with clay; and these frail structures would endure the heat of roaring wood fires, simply because the flame could not reach and envelop the wood. Protect a piece of joist on two sides with plaster, and it will be very hard to make the exposed flat surfaces burn long, and the charred wood soon furnishes a sort of check to further combustion. And this is the correct principle to apply to the protection of wooden houses. Cover the wood as far as possible with mortar, and stop all circulation of air. Having pugged the walls and partitions thoroughly, and treated the stairways in a similar manner by filling in between the supporting stringers or carriages with coarse mortar, we must next make the opening around each chimney tight, where it passes through the floor, by a filling-in of mortar, or by turning trimmer arches against the surrounding timbers on the four sides. On this point, and on the construction of chimneys as bearing upon our present subject, see the article "Concerning Chimneys" in the JOURNAL for January, 1876.

The next vulnerable point is the floor. In France it is often the custom to cross-lath the ceilings with laths considerably thicker than ours, and then to put a flat surface of rough boards a short distance below the under surface of these laths (supporting it by a staging), and to pour in from above a mixture of plaster of Paris, which hardens into a solid mass between the floor timbers and above and below the lathing. When the whole is sufficiently set, the staging is removed and the ceiling "smooth-finished" from below. Plaster of Paris is at present too expensive here for us to follow this method in ordinary cases, but we have a very good substitute in "wire lathing." This is simply what is commonly known as coarse wire netting, which is nailed to the furring strips of a ceiling, and may have coarse mortar spread upon it from above between the floor timbers. The mortar is to be well worked up with a trowel against the sides of the sticks, and then the under side of the wire may be plastered in the ordinary manner from below. This method unfortunately costs about double what ordinary lath and plaster do, besides occupying more time in construction. Another and less expensive safeguard, which it is well to use in connection with this, or which may be made a partial substitute for it, is to cover the rough boarding of the floor with about an inch in thickness of ordinary plasterer's mortar, smoothed over, between inch-square battens nailed to every other floor timber, to furnish a solid ground on which to nail the upper floors. These battens are sometimes taken out after the plaster is hard, and their places filled by fresh plaster, the whole surface covered with sheathing paper, and the upper floors nailed over this. The roofs may also be treated with a coat of plaster or cement, in which the slates should be firmly bedded while it is wet.

All these precautions against fire are also useful to make the house warmer, to deaden sound, and to help to stop leaks. And they are all in one sense economical, for they may save expense in insurance. It is a good maxim in war to do what your enemy least wishes you to do. The fire-fiend craves light wood-work, loosely arranged and full of draught channels. Let him find everything pugged solid with mortar. Make him dig for every inch of wood he seeks to devour, check him, hold him, worry him, cramp him in close quarters. Then with a little presence of mind, a strong arm or two, and a few homely weapons, you can drive him to a corner and finally destroy him altogether. Exercise common caution, use common sense, show a bold front, and the enemy will be driven from your home. J. A. F.

NATURAL HISTORY NOTES.

A BIRD INCENDIARY. — A fire recently originated in a Welsh church in a somewhat singular manner. A little bird had built its nest in the parish church of Ystradgynlais, in Breconshire, in too close proximity to the flue of the heating apparatus. A spark ignited the dry nest, which soon communicated the fire to the adjacent timber-work. Happily, the fire was discovered before much damage was done. Builders and others would do well to guard, where possible, against the incursions of similar innocent but dangerous incendiaries.

BOYISH DESTRUCTIVENESS UTILIZED. — A recent report of the French *Société Central d'Agriculture et d'Horticulture* states that for some years past one of the principal objects of the society has been to encourage the destruction of injurious animals, particularly insects, and the protection of insectivorous birds. The principals of several schools have seconded these efforts in a most praiseworthy manner. School-boys, as a rule, are rather destructive, and advantage is taken of this disposition to kill something. Prizes are offered for the destruction of vermin of all sorts, and at the same time for the preservation of useful birds. Eleven scholars in one school destroyed each 1666 insects, of various sorts, besides 42 nests of caterpillars; and they protected 27 nests of useful birds, sheltering 143 young. This is only one of several cases reported, the numbers of which are mostly much higher. It would appear that insectivorous birds have been almost exterminated in some parts of France, and injurious insects have increased proportionately, so that they have become a formidable scourge.

A PROFITABLE BEAST. — Mr. Charles Jamrach, the famous London dealer in wild beasts, has been doing a good stroke of business with one of his elephants. When the dramatization of Jules Verne's "Round the World in Eighty Days" was brought out at the Porte St. Martin Theatre, in Paris, the manager, M. Larochelle, applied to Jamrach for an elephant to figure in the Indian scenes. A small one was offered for £240, or on hire at £2 a night. M. Larochelle declined to purchase, fearing that the elephant might be a "white" one to him when the play had run its course, and agreed to pay the £2 *per diem*, or rather *per noctem*. But it would have been better for him to have bought the beast outright, for the play had a run of 400

nights; so that Jamrach received £800 for the hire of the elephant, and still has him to sell at about the same figure as a well-bred weight-carrier. He "trumpets" with quite a Parisian accent, and always has a glass of *absinthe* before dinner.

Rats in the English Floods. — It is stated in *Nature* that during the recent heavy floods in England, the low-lying districts of Somersetshire have been submerged beyond precedent, so that it has been possible to sail across country for twenty miles. Many farms and cottages had to be abandoned, and for the first time the railways beyond Bridgewater were covered with several feet of water. One of the results of the flood was the driving from their haunts of great numbers of rats, some of which might have been seen by railway passengers to have taken refuge in willows and other trees along the line. Deserted houses were also taken possession of. In one case a laborer, on proceeding to his cottage by boat to obtain some necessary articles, was about getting into the bedroom window, when he found the room swarming with starving rats, whose demonstrations were so threatening that had he not made a hasty retreat there was every probability he would have been eaten up alive.

SCIENTIFIC BREVITIES.

Plants as Sanitary Scouts. — A London journal raises the question, "How comes it that such a well-known and sensitive plant as the camellia suffers so much in so many living-rooms and windows, that many have given it up for these purposes?" and proceeds to answer it thus: "It is an easy matter to remove the plants and to substitute others of less value. But might it not be far wiser to inquire into the causes of the leaves turning yellow, and the buds dropping off, as they frequently do in living-rooms and window gardens? Is it not, in fact, more than probable that the causes that injure such plants as camellias also injure the human occupants? What are the chief causes that turn the leaves of plants yellow in living-rooms, or make their buds fall? They are chiefly these: gas and fire-dried atmosphere, sudden draughts, and extreme alternations of temperature. Are these more salutary or less injurious to men than to plants? They are more mischievous to us than to plants. The parched atmosphere of our rooms is a constant cause of irritation to weakly or diseased lungs. It dries up the natural juices of the body, excites thirst, and causes exhaustion, and perhaps one of the most grateful and wholesome changes that could be effected in our dwelling-houses would be the genializing, by some skilful means, of our gas, lamp, and fire-burnt atmosphere, that delicate women and children inhale all day and all night long. The plants cannot stand it with impunity, neither can we."

A Lacustrine Tomb. — A Zurich paper reports a discovery which throws light on the hitherto obscure question as to how the lake-dwellers disposed of their dead. Between Anverneir and Colombier, in the vicinity of two lake-dwellings, — one of the stone, the other of the bronze age, — house-building excavations have brought to light a chamber supported by upright stones, and containing ten or fifteen skeletons, the skulls collected in one corner, the other remains in the centre. Near them were found a bear's tooth, a wolf's tooth, a small smooth bone disk, two hatchets of serpentine stone, a bronze needle (all these bored through), a small copper ring, and four small bronze bracelets. It is supposed to be a family grave of a date between the stone and the bronze ages.

Ferments in Flowers and Fruit. — According to M. Blondeau, during the flowering of certain plants we observe an elevation of temperature, accompanied by a disengagement of carbonic acid, which has led certain authors to say that at this period of their existence plants respire in the same manner as animals. In fact, the sugar stored up in the plant then undergoes alcoholic fermentation, and the alcohol formed is burnt, and in burning produces the heat needful for reproduction. When a fruit, as an apple or a pear, has reached maturity, and after being detached from the tree is placed in a vessel of lime-water, the turbidity which appears in the water proves that a development of carbonic acid is taking place. If the fruit, which has thus lived for some time in the absence of air, is submitted to distillation, a notable quantity of alcohol may be obtained, as shown by Lechartier and Bellamy in their researches on the ripening of fruits. Even the simplest vegetables — algæ, lichens, and fungi — contain, throughout their existence, alcohol pre-formed, the combustion of which serves to maintain the heat they need.

Practical Chemistry and the Arts.

COLUMBIUM.

This rare and little known metal should possess for the American investigator a special interest, because it was first discovered in an American mineral, whence it derives its name. Its history is a curious one. It has been confounded at different times with two or three other rare metals, its name changed, its identity denied, its combinations misunderstood, and finally it has been suffered to pass almost into oblivion. The discovery of the new metal gallium in France close upon our Centennial year has directed attention anew to columbium, or, as foreigners call it, niobium.

In 1801 Hatchett discovered a new metal in a Connecticut mineral called columbite, and gave it the name columbium.[1] This mineral, which is found near Haddam and Middletown, Conn., Chesterfield, Beverly, and Northfield, Mass., Acworth, N. H., and elsewhere, consists chiefly of columbic and tantalic acids combined with iron and manganese, traces of tin, copper, lime, and tungsten being sometimes found in it. The first quantitative analysis of it was made by Wollaston,[2] who found 80 per cent. of columbic acid, 15 per cent. of iron, and 5 per cent. of manganese. Wollaston, however, pronounced columbium identical with the metal tantalum, discovered by Ekeberg in 1802, in tantalite from Sweden. Such a mistake at that early day was quite natural, inasmuch as columbite contained both columbium and tantalum. This error remained current until 1846, when H. Rose made a more careful examination of the subject, and discovered that the acid in columbite differed from that in tantalite, and also that there were present in the former mineral two acids which he named niobic and pelopic acids; and hence columbite came to be called niobite.[3] Subsequent investigations led Rose to conclude that the two acids in columbite really contained the same metal [4] associated with different quantities of oxygen, and to these he gave the names of niobic and hyponiobic acids. Here again he was mistaken, for Marignac afterwards showed [5] that there was only one oxide of this metal, the hyponiobic acid of Rose, Nb_2O_5; the other acid, which he had at first called pelopic, and afterward niobic, being really a mixture of the latter acid with tantalic acid.

The difficulty of separating tantalum and niobium, or, as we prefer to call it, columbium, was one of the chief causes of the confusion that has attended its study. According to Marignac, some of the columbite obtained from Greenland contains no tantalum, and from it pure columbic acid is easily prepared as follows: The levigated mineral is fused with six or eight times its weight of sulphate of potassium, in a platinum crucible. The mass is pulverized when cold, and boiled repeatedly with fresh quantities of water; the residue is digested in sulphide of ammonium, filtered, and washed with the same; this residue is then boiled with strong hydrochloric acid, and washed with boiling water. The hydrated niobic acid thus prepared is converted into anhydride by ignition.

The greater the specific gravity of the mineral the more tantalum we may expect to find in it. The following table gives the specific gravity and quantities of tantalic acid in some specimens analyzed by Marignac: —

	Sp. gr.	Ta_2O_5.
1. Columbite from Greenland	5.36	3.3
2. " " Acworth, N. H.	5.65	15.8
3. " " Bodenmais	5.70	13.4
4. " " "	5.92	27.1
5. " " "	6.06	35.4
6. " " Haddam	6.13	31.5
7. Tantalite	7.03	65.6

The oxyfluoride of columbium and potassium is soluble in 13 parts of cold water, and less of boiling water; tantalo-potassic fluoride requires 150 parts of water acidified with hydrofluoric acid to dissolve it. This property is employed to separate the two.

Columbic chloride, $NbCl_5$, is obtained by passing chlorine gas over the oxide mixed with charcoal. The bromide is formed in an analogous manner; the fluoride by simply dissolving the oxide in strong hydrofluoric acid at the ordinary temperatures. It forms crystallizable double salts with other fluorides, and in this, as in the formation of its other haloid salts, shows a striking resemblance to titanium and silicon, although, unlike them, it is quinquivalent.

Another similarity between titanium and columbium is shown in their affinity for nitrogen. The nitride resembles a metal, conducts electricity, is not attacked by nitric acid, scarcely by aqua regia, but readily by a mixture of nitric and hydrofluoric acids. It is formed by heating either the chloride or the oxide in ammonia gas.

Metallic columbium is prepared by heating its fluoride, or the double fluoride of columbium and potassium with sodium in a covered iron crucible, and washing out the soluble salts with water; also, though impure, by heating niobate of sodium in hydrogen gas containing phosphorus vapor. It has a specific gravity of 6.26 to 6.67, is electro-negative, and burns when heated in the air. It dissolves in hydrochloric but not in nitric acid. Little is known of its other properties, as it has been obtained only in small quantities and as a fine powder. As yet no use has been found for either the metal or its compounds.

E. J. H.

MEMORANDA IN THE ARTS.

Hardened Paper. — Recent French journals speak of a method of rendering paper extremely hard and tenacious, by subjecting the pulp to the action of chloride of zinc. After it has been treated with the chloride it is submitted to a strong pressure, thereafter becoming as hard as wood and as tough as leather. The hardness varies according to the strength of the metallic solution. The material thus produced can be easily colored. It may be employed in covering floors with advantage, and may be made to replace leather in the manufacture of coarse shoes, and is a good material for whip-handles, the mountings of saws, buttons, combs, and other articles of various descriptions. An excellent use for it is in large sheets for roofing. Paper already manufactured acquires the same consistency when plunged, unsized, in a solution of the chloride.

Extinguishing Fires at Sea. — A method of extinguishing fires on ships has been lately submitted to the Russian admiralty. Two receptacles

[1] Philosophical Transactions, 1801.
[2] Philosophical Transactions, 1809.
[3] Poggendorff's Annalen, lxiii. 317; lxix. 115.
[4] Poggendorff's Annalen, xc. 456.
[5] Comptes Rendus, lx. 234, 1355: Ann. Ch. Pharm, cxxxv. 49; cxxxvi. 29.

hermetically sealed, and containing anhydrous bicarbonate of soda, are to be placed in the forecastle of the vessel, with two retorts containing sulphuric acid connected to them by a siphon, but closed by means of stopcocks. In case of fire breaking out, the cocks are to be opened, when the mixture of the two substances will generate carbonic acid, to be led through pipes provided for the purpose into the hold, and thus to extinguish the fire. The commission charged with examining into this method reported against it on account of the danger to the crew in case of breakage or leakage of the tubes, and also because, carbonic acid being heavier than air, it would be difficult to free the vessel from it. The *Rivista Maritima* considers, however, that this plan might be adopted with advantage in the powder magazine and in portions of the vessel which are isolated from the rest; besides this, substances are stored on board vessels much more dangerous than carbonic acid, which might be the means of preventing an explosion and the loss of everything.

Utilizing Wave-Power for Ventilation. — Since our article on "Utilizing the Ocean Waves" was written, we have seen accounts in English journals of a "hydro-pneumatic and automatic ventilator" for use on shipboard, which has been tested on two vessels in the British navy, the Malabar and the Osborne, and found to yield very satisfactory results. Air-receivers are placed on each side of a ship, and connected by pipes and valves, while pipes are carried down from the receivers to the bilges of the ship. The pipes connecting the receivers are filled with water, and valves are so placed that, as the vessel rolls and the water rushes to one side, the air is drawn up to the vacuum thus created, to be forced out again as the ship rolls to the other side. So powerful is the blast of air thus pumped out that it is to be used for sounding a fog-horn on the Malabar.

A Patented Cricket Bat. — We see by English papers that the Hon. L. E. Stanhope has taken out a patent for an invention which consists in forming a dovetailed recess in the centre and driving portion of the blade of cricket bats, and filling it in completely with a mixture of gutta-percha and india-rubber, "so as to increase the driving power of the bat."

PRACTICAL HINTS AND RECIPES.

Improved Blacking. — A German authority states that a good blacking for leather may be made thus: Dissolve 11 lbs. of green vitriol and 5 lbs. of tartaric acid in 9 gallons of water. After the settling draw off the clear liquid; then boil 16 lbs. of logwood with about 18 gallons of water and 11 gallons of the fluid. Let the boiled mixture stand for about eight days, pour it off from the sediment, dissolve in it 2 lbs. of grape sugar, and mix this liquid with the green vitriol solution. The blacking so obtained may be made still brighter by mixing the logwood decoction with 4 lbs. of aniline black-blue before the addition of the vitriol. The application of the blacking is very simple. The leather is first well brushed with a solution of soda, or, still better, with spirit of sal-ammoniac, in twenty-five times as much water, to get rid of the grease. The blacking is then applied with the proper brush.

Chrome Cement. — This consists of a strong solution of gelatine, to which has been added, for every five parts of gelatine, one of a solution of acid chromate of lime. The mixture becomes insoluble in water under the action of light, in consequence of the partial reduction of the chromic acid, and this property is utilized in several ways in photography. Professor Schwarz has been experimenting with it as a cement for glass. With a fresh preparation of the solution he covered the surfaces to be united as evenly as possible, pressed them together, and tied them. He then exposed the glass to the sun, and at the end of a few hours the operation had perfectly succeeded. Boiling water had no effect on the oxidized cement, and the fracture could scarcely be recognized. Valuable objects in glass, which would be disfigured with common cement, can be satisfactorily repaired in this manner.

A Cheap and Simple Self-Acting Blowpipe. — An extremely simple form of self-acting blowpipe bellows is described by Herr Laudaner in the *Berichte* of the Berlin Chemical Society. It consists of two large jars, connected near the bottom by a piece of rubber tubing. One is filled with water and put on a shelf above the table on which the other stands. The water passes into the latter, and, in doing so, forces the air out through a stopper and piece of tubing into the blowpipe, which is supported separately. With jars of 4 litres' capacity (about a gallon) and a blowpipe with orifice 0.4 mm. (about .016 of an inch), a constant air-current of 10 minutes' duration is obtained; and to keep it up one has merely to transpose the jars.

Agriculture.

CHEMICAL CORN-GROWING.

Just now there is considerable interest, or perhaps we may say excitement, manifested by the farmers of Massachusetts and the adjoining States, regarding corn-growing by the employment of certain chemical mixtures as fertilizing agents. This is due to the wide-spread notoriety given to some experiments made by Professor Stockbridge, of Amherst, Dr. Sturtevant, of Framingham, and others, who have been experimenting for a year or two past in that direction. We are glad that something has occurred to awaken our farmers from the strange and fatal lethargy in which they have been existing for the last quarter of a century. Whilst there is nothing new in the statements or principles so prominently put forth by the recent experimenters, there are results given which astonish the readers of the agricultural papers.

For a period of *twelve years* we have conducted similar experiments at Lakeside Farm, and in an address given at the Framingham meeting of the Board of Agriculture (1870) the results of the labors were presented so far as they had been reached at that date. Referring to this address, the editor of the *Boston Cultivator* makes the following remarks in its issue of December 18, 1875: —

We invite the attention of all who have the serial volumes of the "Agriculture of Massachusetts," to the lecture by Dr. J. R. Nichols, delivered at the winter meeting of the board in Framingham, in 1870, and published therein, with the report of an interesting discussion that followed. Our attention was called to this in connection with the late discussion at Haverhill, which we did not hear, by a gentleman present. We thought, when we heard Dr. Nichols's lecture, it was one of the most interesting experimental papers that we ever heard, and re-reading it is really refreshing, as it relates to what the doctor did in restoring an exhausted, worn-out farm. Fail not to re-read it if forgotten, for there has been nothing better on that subject that we have seen published, either in this country or in Europe, touching the subject of artificial fertilizers, outside of animal excrements.

We have constantly labored, as the readers of the Journal well understand, to awaken among farmers everywhere an interest in scientific agriculture, and to prove to them the value of chemical fertilizers when properly prepared and understandingly applied. By the use of farm-made compounds of the nature of those which are now recommended by Professor Stockbridge, we raised more than one hundred bushels of corn to the acre eight years ago, and at a cost proportionally as low as is stated by recent experimenters; and we have fields at the farm which have been producing crops under the influence of mineral fertilizers alone for a period of ten years. A careful account has been kept of the methods and results, and these have been published in part, and will be fully stated when some experiments are carried over a longer period of time.

We have never felt quite certain of the utility or safety of presenting to farmers specific formulas for compounding manurial agents, as from the varied conditions of soil, and meteorological states, important modifications are constantly required. It has seemed to us best that the husbandman should become acquainted with the general principles involved in a knowledge of the nature of plant food, and the conditions under which it is available, and then be able to exercise a wise discrimination in the practical use of the same. There are certainly no questions so difficult of satisfactory solution as those which relate to methods of imparting useful information to farmers. If formulas are given for soil treatment in specific crops, there is great liability to disappointment and consequent loss of confidence on the part of those following them; and there can be in a majority of cases no satisfactory explanations afforded as to causes of failure. It is quite easy to give formulas; they can be written with as much scientific accuracy as physician's prescriptions, and perhaps the farm dosing may be as often satisfactory as the human; but a doubt still remains of the expediency of the proceeding. We are, however, in a fair way of having the experiment extensively tried, as Professor Stockbridge has published formulas based on the principles of plant nutrition, and each crop is to receive specific treatment by the employment of specific amounts of the needed salts. If the trials prove generally satisfactory, an important point will be gained in soil cultivation. It will, however, require more than one or three years to settle the matter conclusively.

MAGNESIA AS A FERTILIZER.

The venerable Levi Bartlett, of Warner, N. H., remarks as follows in a communication which appears in a recent number of the *Country Gentleman*: —

Dr. Nichols, of Haverhill, Mass., an expert chemist, farmer, and writer upon agriculture, is the only man I ever knew or heard of who has directly applied sulphate of magnesia (Epsom salts) to the land upon which he grows wheat. His annual average yield is about 30 bushels. He says the ash of wheat affords 12 per cent. of magnesia, or 12 ounces in 100; the straw more than 3 per cent. "A perfect manure, then, adapted to our soils, should contain nitrogen, phosphoric acid, lime, potassa, and magnesia."

In the report of the Department of Agriculture, 1874, appears a valuable paper on the "Condition of Agriculture in the Cotton States," by C. W. Howard, Kingston, Ga. I refer to this report here, to exhibit the principal constituents of the ash of cotton seed, as given by Prof. W. J. Land, of Atlanta, Ga.: "Per cent. potash, over 35; magnesia, 15; phosphoric acid, 30; lime, about 4½ per cent." I

have never heard of magnesia being used as a fertilizer, either North or South, except by Dr. Nichols. Will some of our Northern farmers, the coming spring, give their wheat ground a dose of Epsom salts, and some of the cotton growers at the South experiment on their cotton-growing land in the same way, and report the results through the columns of the *Country Gentleman*? By so doing, possibly, they may be doing the State some service.

The publication of the above has caused a large number of letters of inquiry to be sent to us, which indicate the interest felt in the matter. Our attention was directed to the manifest importance of magnesia in the formation of the seeds of cereal plants, especially wheat and corn, more than ten years ago, when making analyses of the ash of these seeds. The fact that much more magnesia was found in the seeds than in the straw seemed to show that it must play an important and definite part in the formation of the seed; and the amount of magnesia was so large (three times that of the lime, and nearly half that of the potash) as to show unmistakably its importance. It is now nearly ten years since we called attention to the agent magnesia as an ingredient in mixtures designed to be applied to wheat and corn crops, but the suggestions have been strangely overlooked by agricultural chemists and writers. We have always used it upon our wheat fields, and often on corn, and the uniform fine crops obtained afford good ground for conjecture that its influence is a necessary one.

This influence may be exerted in more than a single direction. It supplies unquestionably an important ingredient in the natural food of the cereals, and it may also influence the formation of the soluble nitrogeneous compounds of seeds, the albumen and casein. We know that the seeds of wheat and corn do not always have the same nitrogeneous compounds, although they may contain the same amount of nitrogen; and it is possible that this condition may be abnormal, and due to the absence of the alkaline earths, lime, and notably magnesia.

The salutary influence of magnesia upon the cotton crop on many soils deficient in the element cannot be doubted. Any agent which aids in the formation of well-matured seeds contributes to the abundant and healthful growth of other portions of the plant, and hence the cotton fibre must be increased. We hope experiments will be made in this direction; and to be of service they should be made with intelligent care and under accurate observation.

ENGLISH EXPERIMENTS WITH POTATOES.

An elaborate series of experiments upon potato cultivation was undertaken last year by the Royal Agricultural Society, at twenty stations in various parts of England, Scotland, and Ireland. The results, which have now been collated and published, are thought by our English contemporaries to be of considerable value. The London *Agricultural Gazette* says:—

"The primary idea, indeed, namely, that of discovering a 'disease-proof' potato, was not realized; although the experiments showed clearly that some varieties are freer from the attacks of the disease than others. The Peach Blossom, for example, a late potato raised by Baron Middleton, of Borsdale, Yorkshire, from tubers received in 1869 from New York, was peculiarly free from disease. Among the twenty stations at which this potato was tried, only six suffered from the disease to any great extent, and in no case did the percentage of diseased tubers to healthy ones rise higher than twelve or thirteen per cent. Some of the Improved Red Skin Flour Balls were in many cases free, or almost free, from disease, and were affected to the greatest degree in the neighborhood of Exeter, where twenty-four per cent. of the tubers were diseased. These examples contrast favorably with some of the varieties in the experimental series, while others almost rival them in hardihood. Whether, indeed, a disease-proof potato, by which we mean a potato proof against disease in all localities and under all circumstances, exists is very doubtful; and it is, perhaps, equally doubtful whether any such potato will ever be produced. Granted that a potato resists the disease in 1876, have we any guarantee that it will maintain its immunity the following season, or two seasons hence? . . . . Another practical point well worthy of consideration is that, from the twenty experimental stations, good evidence was collected in favor of large sets, for we are told that, from the instances brought under the notice of the society, 'the potato which starts with a large supply of food in the tuber, and secures by its help a good hold on the soil, and a good mass of foliage in the air, produces the most remunerative crop.'"

GLEANINGS IN FOREIGN FIELDS.

Agricultural Machinery in Turkey. — The British consul at Constantinople, in a report on this subject, says: "Agricultural machinery has made but little progress. An English firm established at Constantinople has gone to much trouble and expense in endeavoring to introduce the first requisites for countries like Turkey, where the population is sparse and the land fertile. They have brought out iron-breasted ploughs, harrows, reapers, and horse threshing-machines, and have satisfactorily exhibited their advantages in the presence of pashas, of councils, and of crowds of farmers and laborers, but only to learn that after their departure the machines have been almost invariably cast aside as useless by an apathetic and ignorant landlord, or by the peasant, who still holds to the plough of his ancestors; and this happens after the English plough has turned up the hardest land with three pairs of buffaloes, and the native implement has failed to make any impression on the same field with fourteen animals harnessed to it."

This shows that human nature is much the same in Turkey and in England. When our friend Hunter imported American ploughs and other implements for Blennerhasset Farm, the Cumberland boors let them rust and go to ruin, preferring to use the heavy and clumsy English patterns to which they were accustomed, though with these they had to work much harder to accomplish much less.

Female Labor on English Farms. — A correspondent of the London *Agricultural Gazette*, criticising the statement by another writer that "female labor is almost unknown in Cumberland, Westmoreland, and North Lancashire," says: "I have an intimate knowledge of Cumberland, and would state that my experience of that county is exactly the reverse; female labor is the rule, and consists in gathering stones in spring from grass land intended to be mown, spreading manure in drills for potatoes and turnips in spring, hoeing green crops in summer, hay-making and corn harvesting, gathering potatoes and pulling turnips in autumn, etc. And right good workers the Cumberland lassies are; for bone and muscle they are not easily surpassed. There is a heartiness in their work, too, that contrasts favorably with many men in other districts. A Cumberland dairy-maid helps to milk the cows, prepares and gives the cows their 'drinks,' steamed hay, and roots, feeds pigs, etc., without at all thinking she is doing more than she should do, and in a way that many a unionist, whose creed is 'high wages and little work,' would do well to imitate. There are many small holdings in Cumberland; many a prosperous farmer and his wife have risen steadily from being 'head man' and dairy-maid, first to a small farm and then to a larger one."

Good Seed. — In a recent communication to a London agricultural journal Mr. J. J. Mechi says: "How important is parental influence! And how unreasonable is the practice (still pursued by some) to sow inferior or unsalable seed as a matter of economy! Admirably as our dressing machines now separate inferior seeds, still the more powerful blower which follows soon exhibits a selection of light or comparatively imperfect kernels or seeds. A good ordinary sample of dressed corn passed through a powerful blower comes out in very improved condition. I invariably blow all my seed corn, and by doing this with fen oats often extract one fourth as unfit for sowing. The same remark applies in degree to grass and other seeds. In the case of pease and beans, a ruddle or screen gets rid of the 'scringelings.' How forcibly and clearly does Liebig, in his 'Natural Laws of Husbandry,' enforce the necessity for care in selection of seed: 'The development of a plant depends upon its first radication, and the choice of proper seeds is, therefore, of the highest importance for the future plant. Poor and sickly seeds will produce stunted plants, which, again, will yield seeds bearing, in a great measure, the same character. The horticulturist knows the natural relation which the condition of the seed bears to the production of a plant which is to possess all or only some properties of the species; like the cattle-breeder, who, with a view to propagation and increase of stock, selects only the healthiest and best-formed animals for his purpose.'"

Flowers for Food. — Though flowers are much used in medicine, it is not often that they are employed as an article of food. The *Gardener's Chronicle*, of London, reminds us that the capers of our "caper sauce" are the flower-buds of *Capparis spinosa*, or of *Zygophyllum fabago*, which latter are occasionally substituted for real capers. In many parts of India, however, Dr. Brandis tells us, the flowers of a Sapotaceous tree, *Bassia latifolia*, form a really important article of food. These blossoms, which are succulent and very numerous, fall by night in large quantities from the tree, and are gathered up early in the morning; they have a sweet but sickly taste and smell. They are then dried in the sun and sold in the bazaars. An ardent spirit, which is strong and intoxicating, is distilled from these flowers by the hill people, who also eat them either raw or cooked, often with parched grain; they are also put into sweetmeats. The blossoms of another species, *B. longifolia*, are employed in a similar manner by the natives of Mysore and Malabar, where it abounds; they are either dried and roasted, and then eaten, or bruised and boiled to a jelly and made into small balls, which are sold or exchanged for fish, rice, and various sorts of small grain. The flowers of both species are also eaten by owls, squirrels, lizards, jackals, etc.; and Roxburgh mentions a report that the last-named animals "are apt to grow mad by too much feeding on them," especially in the time of blossom.

A Famous Old Vineyard. — The celebrated "Clos Vougeot" is a remarkable instance of the prolonged fertility of a vineyard with but little artificial aid. In A. D. 904 the "Clos" was a waste of about 145 English acres, of which a couple of acres were set with vines. About this time the Benedictine monks, and afterwards the Bernardines, who came into possession of the land, began clearing. The surface blocks of stone which covered much of the ground, and were rarely found adherent to the subjacent rock, were removed and formed into

piles. The soil was levelled and dug to a uniform depth of 16 inches or so, and the ground set out with vines. By and by, hollows and irregularities were filled up with stones from the piles, with a light covering of soil, and planted in like manner, as were also the sites of the piles themselves. The last vines were planted in 1234, and are still known as the "young vines." This is no fancy sketch. The history of the ground has documentary evidence to vouch for it, and what is more, the details of the planting are still distinguished by the vintagers. It has been said that the vines propagate themselves. As the old rods are headed down they leave in the ground stools, which appear to be almost proof against decay. These stools form a sort of continuous carpet about 12 inches below the surface of the soil, being thickest under the vines of 904, and thinnest under those of 1234.

Poetry of the S. P. C. A. — The following verses are issued on leaflets for distribution to drivers and others having the care of horses, and on cards for hanging up in stables, by the English Society for the Prevention of Cruelty to Animals : —

Going up hill, whip me not;
Coming down hill, hurry me not;
On level ground, spare me not;
Loose in stable, forget me not.

Of hay and corn rob me not;
Of clean water stint me not;
With sponge and water neglect me not;
Of soft, dry bed, deprive me not.

Tired or hot, wash me not;
If sick or old, chill me not;
With bit or reins, oh, jerk me not;
And when you are angry, strike me not.

DAIRY NOTES.

Effect of Cold on the Formation of Cream. — In a paper read at the Académie des Sciences, M. Tisserand states that when milk is submitted, soon after milking, to various temperatures from 0° to 36° C. (32° to 96.8° F.), and the same temperature is kept up for twenty-four hours, the following results are obtained: (1.) The production of cream is rapid in proportion as the temperature to which it has been exposed approaches zero. (2.) The volume of cream obtained is greatest when the milk has been exposed to the greatest cold. (3.) The production of butter is also greater. (4.) The skimmed milk, butter, and cheese of milk so treated are all better. These facts show how erroneous are the ideas that prevail in France on the production of cream and butter, that milk intended to be skimmed should be kept at a temperature of 12° or 13° C., and not allowed to descend below this temperature, under the idea that the rising of the cream is thus favored.

Dorsetshire Cheese. — The cheese made in Dorsetshire, though in high favor within the limits of the county, has not so good a reputation elsewhere in England, though it is said to be improving in quality and commanding a better price. So despised was it at one time out of the county that many ridiculous stories were told of it, of which the following are samples given in a recent English paper: "(1.) The captain of a small trading vessel had a lot of Dorset cheese and a lot of grindstones on board; through a slight mistake, the rats ate the grindstones and left the cheese. (2.) A friend in the country sent his friend in town, as a great treat, two real mouldy Dorset cheeses. Their smell, however, was not appreciated, and, instead of being pleased, the one idea of the Londoner was to get rid of his present. Accordingly, when night comes, outside the door goes one cheese, and in the morning he discovers that the cheese is gone. The following night out goes the other cheese, but morning light reveals the fact that not only is the cheese still there, but its companion has been brought back, and lies upon it."

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Jas. R. Nichols, M. D., *Editor.*
Wm. J. Rolfe, A. M., *Associate Editor.*

BOSTON, APRIL 1, 1876.

SPONTANEOUS GENERATION.

Professor Tyndall is again deeply involved in controversy; this time not with the clergy or theologians, but with the supporters of the "spontaneous generation" theory. Dr. Bastian, the distinguished naturalist and experimenter, is his most prominent antagonist, and the war is carried on not only through the columns of scientific journals, but in the *Times*, and other popular newspapers. Several years ago Professor Tyndall conducted some experiments which led him to conclude that atmospheric air held the germs from which sprang all the various forms of life found in the mixtures and infusions of Dr. Bastian and others, and consequently the notion that they come into existence *de novo* is a fallacy. In Tyndall's experiments with air, he found it loaded under all ordinary conditions with minute particles and organisms, which alone conferred upon it the power of scattering light. An absolutely clean volume of air has no diffusive power upon rays of light; consequently, if the atmosphere was entirely free from impurities we should be involved in darkness. This condition of the atmosphere awakened his suspicions that the experiments alleged to prove spontaneous generation possible were not reliable, and he therefore instituted a series in his own laboratory, the results of which he recently laid before the Royal Society.

He states that he boiled a large number of organic infusions so as to destroy any bacteria or germs existing in them, placed them in tubes exposed to air which had been deprived of the floating particles, the presence of which produced the scattering effect upon a beam of transmitted light, and the result was that not in a single instance did life appear, or the phenomena of putrefaction occur. On the other hand, tubes containing similar infusions, exposed under like conditions, as to time and temperature, to ordinary air, fell into active putrefaction and developed an abundance of life. Results of this nature, if reliable, of course at once deprived Dr. Bastian and others of all ground to stand upon, and stamped them as empirics. Dr. Bastian states in his book, "Evolution and the Origin of Life," that "we now know that boiled infusions exposed to air filtered or calcined, or shut off altogether from contact with air, are more or less proved to *swarm* with bacteria and vibriones in a few days." Tyndall boldly attacks the doctor, and asks contemptuously, "Who are the 'we' that possess this knowledge?" Dr. Bastian replies in *Nature* by naming an array of distinguished scientists who advocate the doctrine of spontaneous generation, which would appal any less confident experimenter than Tyndall, and so the contest goes on.

Bastian claims that Tyndall's experiments are unreliable, from the circumstance that he did not conduct them with due regard to the temperature at which the infusions were to be maintained. He urges that instead of keeping them at a temperature of only 60° or 70° F., as did Tyndall, he should have tried 80° or 95° F. This matter of temperature he claims is of immense importance to the success of the experiments. He goes on to say that, looking to the very striking manner in which Professor Tyndall has deviated from the requisite experimental conditions in regard to temperature, it is impossible to have full confidence that he prepared the infusions in the manner prescribed. As regards the hundred and thirty-nine instances in which Tyndall failed to obtain the results indicated by him as being obtainable, Bastian says that "if so grave a question were not concerned, all this would be truly laughable, and, as it seems to him, far more like burlesque than the sober pursuit of science." Tyndall replies to this in the *Times*, and says that the "temperature hypothesis" of Dr. Bastian will not answer, as he prepared his infusions with scrupulous regard to his prescriptions, and the temperature was maintained for weeks at from 80° to 90° F., and nevertheless they remained perfectly sterile throughout. It is, however, apparent from the admissions made by Professor Tyndall that he did not *fully* comply with Bastian's conditions, and so the question remains an unsettled one.

The matter is one of grave importance, and it has for years remained in a state of confusion and uncertainty. Why cannot the question be decided once for all? If Professor Tyndall and Dr. Bastian, who represent the most able of the opposing investigators, will drop their acrimonious disputes in the journals, and join in a series of exhaustive experiments, under such conditions as will be satisfactory to both, then we may, perhaps, have results which will set the question at rest. It is certainly very desirable that some joint undertaking of this nature may be entered upon at an early day.

ZINC CULINARY VESSELS.

George Parmelee, Esq., President of the Michigan State Pomological Society, writes to inquire if there is any kind of sheet metal vessels suitable to boil cider in, and adds, "I supposed it would act on copper or brass, and so I tried last fall a boiler made of *galvanized iron*, but the product was very bad, not fit to use. It had a filthy, metallic taste, and it was thrown away as a dangerous liquid."

We felt inclined, upon reading the statement, to express surprise that a gentleman so intelligent as our correspondent should venture to boil cider or any other liquid used as a food or beverage in a galvanized iron vessel; but when we remembered that so distinguished a body as our Massachusetts State Board of Health admitted into their annual report for 1875 a paper which informs the reader that zinced water-pipes and culinary vessels are *perfectly harmless*, we withhold comments of that nature. There is not a particle of doubt that the evaporated cider *was poisonous*, and fortunate is it that the liquid had a "filthy metallic taste," and was thrown

away. Water boiled in a vessel of that nature also becomes poisonous, and, further, cold water passed through zinced iron pipes becomes poisonous, and should never be used in families.

For evaporating cider, and other liquids and sauces, porcelain-lined ware is the most suitable and the safest. When large quantities are to be boiled, the caldrons holding fifty or one hundred gallons may be used. They are manufactured in this country and in Europe.

MICROSCOPICAL EXAMINATION OF BLOOD.

A SERIES of remarkable photographs of human blood has been kindly sent to us by Dr. E. Cutter, of Cambridge. These photographs represent both healthy and diseased blood, and were taken at the rooms of J. W. Black & Co., of this city, under the supervision of Drs. Cutter and Harriman. They are remarkable as the first photographs of the kind ever taken. The objectives employed were a $\frac{1}{5}\frac{1}{0}$ and a $\frac{1}{7}\frac{1}{5}$; the latter made by Tolles, and belonging to Dr. Harriman. This objective is the highest and best ever made in this country, and it is probable none better has ever been made by any optician. The red and white corpuscles are shown upon the plate of immense size, the white ones being nearly $\frac{3}{4}$ of an inch across the disks. The physical changes going on *inside* the white corpuscles are distinctly seen, and in one plate is represented a white corpuscle which burst asunder, and poured out its contents by the side of others. This is extraordinary, and must awaken great interest among physiologists. The photography of diseased blood has, we believe, never been attempted before, and certainly it opens up new views of the vital fluid in its pathological conditions. Doubtless physicians can obtain copies of these photographs at some future time.

"MAGNETIC" FOOD.

"MAGNETISM" has long been a favorite term with charlatans, and it seems to have a kind of magnetic power over the ignorant and credulous. "Magnetic wells" and "springs," the water of which when flowing in an *iron pipe* has the remarkable property of attracting the magnetic needle, have proved equally potent in attracting invalids to drink the healing liquid. Magnetic food to accompany this magnetic drink was obviously a desideratum, and now some English inventors are prepared to supply it. They have actually obtained a patent for a "new method of applying magnetism in articles of food." The *English Mechanic* gives the following account of their process: —

"They take precipitated magnetic oxide of iron, *or any other magnetic or magnetizable matter*, mixed with any suitable food substances, and then magnetize the mixture by passing it through a helix of copper wire which is traversed by an electric current. The magnetic oxide of iron is prepared by making a saturated solution of pure sulphate of iron in boiling water acidulated with pure sulphuric acid. To two quarts of the boiling solution half a pint of nitric acid of 1.36 specific gravity is added, and the mixture boiled, when the whole of the 'ferrous' solution will be converted into 'ferric.' One quart of the 'plain ferrous' solution is then added, and the whole again boiled. Three pounds of crystallized carbonate of soda are then added, and the mixture is boiled till the whole of the iron is precipitated as the magnetic oxide. After settling, the clear liquor is decanted off, and the precipitate is thoroughly washed and dried.

"The magnetic oxide thus prepared may be administered in the form of powders, but the 'inventors' prefer to mix it with foods, condiments, troches, glycicals, and sweetmeats of all kinds, making magnetic lozenges, jujubes, cough drops, etc., as well as magnetic bread, biscuits, and so on. When it is desired to make magnetic bread, the inventors prefer to use carbonate of ammonia to precipitate the magnetic oxide from the mother liquor, as the small quantity of carbonate of ammonia 'held in suspension' by the precipitate may be made use of to add lightness and 'parocity' (*sic*) to the dough. The magnetic bread is made in the proportion of one part of magnetic oxide to 11 parts of flour and other ingredients, and is afterwards magnetized in the manner above mentioned, but whether before or after baking is not stated. Magnetic lozenges are made by taking one part of magnetic oxide, two of gum, two of sugar, and two of water, beating the whole together into a suitable mass for lozenges, which are afterwards magnetized by passing them through the copper helix. The inventors claim the 'novel and peculiar application and use of magnetism in manufacturing articles of food, etc., to be used for medicinal, curative, and other analogous purposes.'

"These are the details of an 'invention' for which letters patent have been granted in the nineteenth century. We presume that the patentees would have no objection to any one magnetizing legs of mutton, or chops and steaks, and using magnetic oxide in lieu of salt, but whether the chops and steaks should be magnetized before or after cooking we cannot say. We should think that, so far as any medicinal or curative results are concerned, it will not matter. Faith is all that is required — and the money to purchase the chops."

BENJAMIN THOMPSON, COUNT RUMFORD.

JUST about one hundred years ago a young man left Boston with the British army, seemingly from no choice of his own but simply because the chief among the patriots of New Hampshire suspected that he was not loyal to the cause of freedom, and they appear to have acted upon the principle of convicting him first and trying him afterwards. He was only twenty-two when he left this country, and he never returned to it again except for a short time, when he served in the British army as colonel of cavalry in South Carolina and New York. Previous to this service he had for some time served the British government as under secretary of state. If these had been his only services rendered to mankind, Colonel Thompson would have been forgotten long ago. But after he returned to England he found himself with nothing to do. He still received his half-pay as a retired officer of the army, but his regiment had been disbanded at the close of the war. In this strait he started on his travels as a soldier of fortune. By chance almost, it seems, he strayed to Munich, where he soon entered into the employ of the King of Bavaria, still retaining his allegiance to the English government.

When he went to Munich he found everything in as miserable a state as could well be imagined. One sixth of the inhabitants subsisted by beggary, and the army was but little better than an armed mob of beggars, who were systematically starved and forced to go half naked. When he left Munich there was not a beggar in the country, and the army was one of the best clothed and best fed in the world. But this was not all; while doing all this work in reorganizing the social system of a state, he still found time to write essays and make experiments on various subjects which are only now beginning to be appreciated. He taught the people how to cook their food more economically, while at the same time he made experiments which overturned all previous ideas in regard to heat, and established firmly the modern theory that heat is motion.

He wrote essays on Indian corn, and made experiments on the best methods of taking a bath; in short, no subject seems to have escaped his attention. But he appears to have always remembered the land of his birth, and in his will he made Harvard College his residuary legatee, besides founding a professorship in it of heat and light applied to the science of living. He also gave five thousand dollars to the American Academy at Boston, to found prizes for discoveries in these branches of science. This latter sum has accumulated until now it amounts to over forty-two thousand dollars. The Supreme Court of the State has permitted it to be slightly diverted from the original purpose, while still keeping the main object in view, and the income is now used for distributing information on these subjects and paying for original investigations.

As a means of disseminating information the Academy has thought that nothing would be more valuable than the works of the count. These have been collected and carefully edited, and are now published in four large volumes, together with his life, which makes a fifth. Part of the fourth volume, which has just been published, deserves a much wider circulation than it will get in the volumes before us. We refer to the two essays on the treatment of the poor, which detail at length how the tramp nuisance was suppressed in Bavaria. It had arrived at a much worse point there than here, and the country was far poorer than ours, yet the evil was successfully and completely met.

The volumes are published by the American Academy, of Boston, at the price of five dollars per volume. S.

EDITORIAL NOTES.

AN ARISTOCRATIC BEVERAGE. — We have several times given illustrations of the neglect of sanitary laws in some of the most aristocratic quarters of London, even in this day of general enlightenment and "reform" in matters affecting the public health. The latest English papers that have come to hand give us the results of an investigation made by Dr. Dudfield, the medical officer of the Kensington district, in a household which had been afflicted with diphtheria. The inhabitants of this house, in a "fashionable" locality, drank water from a large cistern in the roof, which was "uncovered and in a filthy condition," and they also partook of a decoction drawn from the cistern in the basement; in fact, the water from this cistern was used principally for domestic purposes. On examination it was found to contain the "wings of hundreds of cockroaches, whose bodies, after being slowly macerated, had been consumed by the household." The large cistern was in direct communication with the soil-pipe by means of the "waste."

A HIBERNIAN LECTURE ON THE MOON. — There is no harm in presenting scientific facts in a lively manner, but the Dean of Cashel appears to have gone about as far in that direction as it is well to venture. A Tipperary paper devotes some columns to the dean's lecture on "The Moon, considered as our Neighbor, Companion, and Friend," and the way in which he makes merry over the lunar orb and our relations with it is, in a scientific man and grave church dignitary, something astounding. After a dissertation on our partner's fickleness and ours, the reverend gentleman says, "Still, like good, generous husbands, we make up to her for many of our shortcomings, and we actually give her about fourteen times as much light as she gives to us — a very fair allowance, perhaps an extravagant one, especially for people who have to borrow all they give." Having prepared our minds by this little sally — by no means the first in his lecture — the dean goes on: "I

have said that our bright companion travels round us at the rate of forty miles a minute. Indeed, we're a lively pair, for we ourselves are meantime travelling along at the rate of seventeen miles a second, and carrying her along with us. Did it ever occur to you that whenever you take off your hat to a lady in the street you go between thirty and forty miles bareheaded through the air, but you never catch cold from such an act of courtesy?" After this digression the dean proceeds to his climax by informing us that "this sprightly companion of ours has another motion round her own axis, or, to make it more familiar, she whirls about on her toes, and, not to be outdone by her, we whirl about on ours in the same way, and then we waltz away forever through the great drawing-room of space."

Chemistry and Modern Thought. — This was the subject of a paper read in January by Mr. H. B. Baildon at a scientific meeting in Edinburgh. In the course of it he remarked that chemistry, like all other sciences, was full of unanswered questions. Mature and elaborate as it was, it had not surrendered the keys of its causation. We might talk glibly enough of chemical affinities, though we could give no reason for them. It was possible that at some future time a further step might be made; some relation between the form of the molecules and these affinities might be discovered. But it seemed certain, from all previous experience, that, virtually, the same question would remain unanswered — a law being found according to which the molecules attract each other, but for whose existence no reason could be assigned. Passing on to inquire what bearing chemistry had upon Tyndall's notion of matter, the professor found in matter, firstly, the "promise of all terrestrial life." Did he mean that there was nothing but matter in existence? If so, it was contradictory to the professor's own admission of the mystery of mind. Did it mean that the material or physical universe consisted of matter? That was tautologic. Or did it mean that matter traced back to its simplest forms gave promise of its future destiny? If so, this last could flatly be denied. Matter in its simplest forms consisted of a number of separate elements. So long as these were kept apart, they exhibited peculiar and distinct properties. But on taking two whose single properties were known, and allowing them to combine, there appeared what was virtually a new creation, a substance possessing qualities different from those of its constituents. Neither of these, therefore, could be said to afford the promise of the resulting product. After a reference to the law of combination by weight, the reader treated of combination by volume, diffusion of gases, and crystallization. He concluded by saying that to his mind the fact of crystallization was higher than that of any law they had yet dealt with; it declared most distinctly the connection between beauty and purity, the tendency of the crystal being to cast out all chemical impurity.

The Harvard Astronomical Engravings. — We referred more than a year ago to the series of astronomical engravings in course of preparation at the Harvard College Observatory under the direction of the late lamented Professor Winlock. The entire set of thirty plates is now complete, and includes views of the leading planets, solar spots and prominences, lunar craters, comets, nebulæ, etc., accurately delineated as seen by the great refractor of the observatory. The drawings of the nebulæ, the elaboration of which has been a delicate and difficult task, are especially beautiful, and are alone worth the ten dollars asked for the whole series. The plates ought to be put on sale in Boston, where teachers and amateurs could examine them. We fear they are not so widely known as they deserve to be; but they need only to be seen in order to be appreciated.

ATOMS.

A sort of artificial ivory, which can be carved or moulded, is prepared in Berlin, by mixing phosphate of lime intimately with gutta-percha. — Mr. Hampden, the English "flat" who maintains that the earth is not a globe, but a flat surface, and who was sentenced to twelve months' imprisonment last spring for libelling the celebrated naturalist, Mr. Wallace, has just been released from jail. — The Vanguard has, it is stated, become nearly covered with sand, so that all hopes of raising her must be abandoned; while, if orders are not speedily given to blow her up, nothing whatever will be recovered from her. — The horse-meat establishments in Paris delivered for consumption during the past year 6865 horses, asses, or mules, which yielded 1,249,190 kilogrammes (2.2 lbs. each). — The Berlin Museum bought some years ago in Jerusalem, for about 28,000 thalers, some Moabite antiquities, the age of which was supposed to amount to 2500 years; it has turned out now that these monuments are not genuine. — The *Japan Mail* states that a recently completed census of the empire makes the population 33,300,675, showing an increase of 189,850 since the last census was taken, three years ago. — A French chemist has discovered the elixir of life in sour buttermilk, the lactic acid in which dissolves the products of organic combustion, which, as ossifying and calcareous degenerations, are the main agents in the death of the aged. — Professor Jaillard says that in order to prevent the irritating action of chloroform on the mucous membrane of the mouth, it is only necessary to administer it in milk, which, if wished, can be sweetened. — The ivory nut (the kernel of the *Phytelephas macrocarpa*), or vegetable ivory, is in such demand in the German market that its price in Carthagena, the port to which it is brought from the forests bordering the rivers Atrato and Magdalena, has nearly doubled within a short time. — One thirtieth of all the land under cultivation in Spain is devoted to the growth of olives. — We grieve to learn that the seven rattlesnakes of the Jardin des Plantes in Paris have all died of cold this winter. — The extent to which phosphorus is soluble in glycerine has not been accurately determined, but experiments by J. Williams seem to indicate that one grain of phosphorus will readily dissolve in fourteen fluid drachms of hot glycerine, without subsequent deposition. — Recent numbers of *Schermerhorn's Monthly* (formerly known as the "American Educational Monthly") have contained articles of special interest to all classical teachers. — The new metal gallium has been obtained in a pure state by M. Lecoq, and is found to have a brilliancy between that of platinum and that of silver. — The peppermint crop of a single county in Illinois last year reached the value of half a million of dollars. — Dr. Halford's remedy for the treatment of snake-bites by the intravenous injection of ammonia has been frequently tried during the year in Australia, and is reported to have been most successful; but it does not appear to prove equally effective against the venom of the more poisonous snakes of India. — *Harper's Magazine* is publishing an entertaining series of illustrated papers on the Microscope, by Prof. S. Lockwood. — The last number of the *American Architect* contains some finely executed heliotypes of the "reform" plans for the Capitol at Albany. — The editor of the London *Agricultural Gazette* pays this compliment to the Yankee beef carried over in the Guion steamers: "We have tasted some of this meat, both in the form of steaks and as a roasted joint, and we may say that we have never eaten beef of finer quality, or in a more perfect condition." — The *American Naturalist* continues to improve under its new Riverside management; the March number is an unusually interesting one, not only to the naturalist but to the general reader.

LITERARY NOTES.

The Appletons reprint in two neat volumes the English translation of Haeckel's *History of Creation*, or, as the title further explains it, "The Development of the Earth and its Inhabitants by the Action of Natural Causes; a Popular Exposition of the Doctrine of Evolution in general, and of that of Darwin, Goethe, and Lamarck in particular." Haeckel has been called by his own countrymen the German Darwin, and he certainly holds the leading place among the apostles of Darwinism. He even goes beyond his master in attempting to establish on Darwinian principles a natural classification of organisms, and to indicate by what steps in the lapse of ages they have become what they now are. He believes that all the phenomena of life have been produced by purely mechanical causes, without miraculous intervention; or, in other words, that organic beings have been evolved from inorganic matter by the action of physical forces. Though we may not accept his theory, we cannot but admire the ingenuity of his arguments and the skill with which he marshals the vast array of facts he has brought together in support of his views. The popularity of the work in Germany is shown by the fact that it has already run through six editions there. This English translation, made by a young lady and revised by E. Ray Lankester, a devoted disciple of Haeckel, is an excellent one, and the ethnographical map and other illustrations are well reproduced in the American edition.

The same house are the American publishers of *A General History of Greece*, by G. W. Cox, M. A., author of "Tales of Ancient Greece," "Mythology of the Aryan Nations," etc. He has aimed "to present the history of the Greek people in a form which may interest readers of all classes, as well as the scholar and the critic;" and we think he has succeeded in making a very useful book, somewhat fuller and far more readable than the ordinary school manuals, but not so voluminous and costly as Grote, Curtius, and the like. It is just the work we should put into the hands of the young student for reading in connection with his school text-book; while it would make an excellent text-book for the more advanced student. It contains some good maps, a chronological table with convenient references to the pages of the book, and a very full index.

Mr. C. W. Sever, of Cambridge, has issued the third thousand of the revised edition of the *General Rules for Punctuation*, by Prof. A. S. Hill, of Harvard College, a 25-cent pamphlet which for all practical purposes is better than any of the more costly treatises on the subject. The rules laid down are few, but they cover the ground well, and are admirably expressed and illustrated. They also represent the best *present* usage, which the summaries in most of the school grammars do *not*; and the cases in which usage varies are stated with judicial impartiality.

The "Little Classic" edition of Hawthorne (Osgood & Co.) is now nearly complete, and more and more popular. The latest issue is the *American Note-Books*, in two volumes. Like the other "Note-Books," though not intended for publication, they are peculiarly interesting, from their connection with the material of the author's finished works, and the "inside view" they give us of his mental processes. They abound also in bits of graphic description and touches of quaint humor.

The "Vest-Pocket Series" is also very popular, and Osgood & Co. are prompt in supplying the demand for fresh volumes. Among the latest are Dickens's *Christmas Carol*, Lowell's *Sir Launfal*, Mrs. Browning's *Lady Geraldine's Courtship*, and Goldsmith's *Deserted Village and Traveller*, all in good clear type, and all illustrated with cuts selected from the larger editions.

Mrs. Whitney's new book, *Sights and Insights* (Osgood & Co.), is a pleasant series of pictures of European travel strung together by a thread of fiction. Tourists generally weave a good deal of fiction into the story of their wanderings, but as a traveller Mrs. Whitney is very truthful, keeping the romance strictly to its own place in the book. No one should be deterred from reading it by the preface, which is affected and silly.

The Ginn Brothers publish Thomas Arnold's *Manual of English Literature*, a good book of its class, improved by the changes the American editor has made; also Rev. H. N. Hudson's *Text-Book of Prose*, which is made up of judicious selections from Burke (325 pp.), Webster (220 pp.), and Bacon (85 pp.), with good sketches of their lives, and notes that seem to us too few and brief for educational purposes. The author of course supplements them with oral instruction, but not one teacher out of a hundred is competent to do this well. The book will nevertheless be welcomed as making it possible to use Burke, Webster, and Bacon in school, by furnishing them in a cheap form. The Bacon is issued separately in paper covers for 40 cents.

All these books may be found at Lockwood, Brooks, & Co.'s. Their "Harvard Book-Rack," sold for a dollar, is not only the cheapest but really the most useful thing of the kind we have seen. The advertisement will give an idea of it.

The translation of Naquet's *Legal Chemistry*, just published by Van Nostrand (see advertisement), makes this excellent little manual accessible to American chemists in a cheap and convenient form, and with some improvements on the original.

The Harpers will soon publish Mr. Rolfe's edition of *Select Poems of Thomas Gray*, including the Elegy, the Pindaric and other odes, etc. It is a curious fact that, often as Gray has been edited, the *editio princeps* of 1768, brought out under his own eye, is the most accurate. The second line of the Elegy has not been printed correctly during the present century, and most of the modern texts are otherwise corrupt. In this new edition the correct readings have been restored, and defended. The book will also be very attractive for its illustrations.

Medicine and Pharmacy.

PROPYLAMINE IN RHEUMATISM.

Among the various medical agents that have been employed in the treatment of rheumatism, no one has attracted more attention of late in Europe than propylamine. Of recent testimonials to its value in this disease we select the following, from the London *Lancet*, on account of the definite information it gives concerning the cases in which it was tried, and the effects it produced: —

"Dr. Lee has treated twenty-eight cases of acute rheumatism with a solution of one gramme of propylamine and ten of sugar in one hundred and twenty grammes of peppermint-water, of which a tablespoonful was given every two hours; in all, from three to five grammes were so taken by each patient, whose limbs were bandaged with cotton-wool and card-board. All the twenty-eight cases suffered from multiple joint-affections; in fourteen cases the disease disappeared at the first time, in the other fourteen it was recurrent once or repeatedly. Five cases were complicated with slight, five with severe affection of the heart, one with acute œdema of lungs, and one with diphtheria. All were restored to perfect health and military duty except one. The average duration of the illness in these cases was 17.7 days per head; none was discharged before full recovery was proved by increased weight of body and gymnastic exercises. The effect of propylamine is summed up as follows: (1.) The disease becomes very soon subacute, and remains so to the last. (2.) The sedative effect on the nervous system is shown by decreased tension in the circulatory apparatus; pulse and respiration become slower, and high fever decreases within thirty-six hours. (3.) With at first profuse, then more gentle respiration, pain decreases very markedly. (4.) The color of the skin acquires a peculiar grayish tint. (5.) Sleep quickly returns, and is not interrupted by pain. (6.) With a cleaner tongue, appetite returns fast. (7.) The quantity of urine is not much increased; it is mostly clear and transparent, only slightly acid, and with little sediment. (8.) All patients took the drug without dislike; it was never applied externally."

Attention was first called to this use of propylamine in the Journal as long ago as April, 1859, since which time it has been manufactured by J. R. Nichols & Co. and their successors, Billings, Clapp, & Co. Though no special effort has been made to bring it to the notice of the profession, the demand for it has steadily increased, and was never so great as at the present time.

Propylamine was first thoroughly tested in rheumatism by Dr. Awenarius, a Russian physician, who administered it to two hundred and fifty patients in the hospitals of St. Petersburg, between March, 1854, and June, 1856; and in acute cases the pain and fever always disappeared the next day. His experience led him to pronounce it "a true specific for the various affections of rheumatic origin." If in rare instances it has not given results so favorable, this was probably owing, as European authorities suggest, to the fact that it was impure or diluted. They assert that when pure, the agent invariably accomplishes all that has been claimed for it.

In the *Indiana Journal of Medicine*, Dr. J. M. Gaston states that he has used propylamine in rheumatism *for eight years*, and with marked success. The following is a brief extract from his article: —

"In no single instance have the pain and the soreness of the parts failed to yield completely in twenty-four or forty-eight hours, the cure progressing from that time on without interruption, except in two cases, occurring in individuals affected with gonorrhœa at the same time; and even in these two cases it afforded decided relief, but failed further to arrest the disease, and so did everything else that I could do, and I finally lost sight of both cases. It will be remembered here that of all forms of rheumatism, gonorrhœal rheumatism is the most inveterate and unamenable to treatment."

After describing some cases in which he has used the remedy, Dr. Gaston says that he has before fancied he had found "the true remedy for rheumatism," but it has soon "disappointed and deceived" him. "But in the case of this," he adds, "the time has been so long, and the success so uniform and good that it must be more than a simple coincidence."

The formula which he recommends for administering propylamine is as follows: —

Propylamine	50 to 100 drops.
Distilled water	8 ounces. M.

Dose: tablespoonful every two hours to adult.

This is a larger dose, he says, than the foreign authorities prescribe, but experience has assured him that it is within the bounds of perfect safety.

GRAINS AND GRAMMES.

The following table for reducing apothecaries' weights to those of the metric system we have prepared for the convenience of the readers of the Journal, and they will find it exact enough for all practical purposes: —

Apothecaries' Weights.	Grammes.	Apothecaries' Weights.	Grammes.
Grain $\frac{1}{10}$	0.006	Grains 80	5.18
" $\frac{1}{8}$	0.008	" 90	5.83
" $\frac{1}{6}$	0.011	" 96	6.22
" $\frac{1}{5}$	0.012	" 100	6.48
" $\frac{1}{4}$	0.016	" 120 (℥ij)	7.77
" $\frac{1}{3}$	0.021	" 150	9.72
" $\frac{1}{2}$	0.032	" 160	10.37
" $\frac{2}{3}$	0.042	" 180 (℥iij)	11.66
" $\frac{3}{4}$	0.048	" 200	12.96
" 1	0.065	" 240 (℥ss)	15.55
Grains 2	0.13	Drachms 5	19.44
" 3	0.194	" $5\frac{1}{2}$	21.38
" 4	0.259	" 6	23.33
" 5	0.324	" 7	27.21
" 6	0.389	" 8 (℥j)	31.1
" 7	0.453	" 9	34.99
" 8	0.518	" 10	38.88
" 9	0.583	" 12	46.66
" 10	0.648	" 14	54.35
" 12	0.777	" 16 (℥ij)	62.2
" 14	0.907	" 18	69.99
" 15	0.972	" 20	77.76
" 16	1.037	" 24 (℥iij)	93.31
" 18	1.166	Ounces $3\frac{1}{2}$	108.81
" 20 (℈j)	1.296	" 4	124.41
" 24	1.555	" $4\frac{1}{2}$	139.91
" 30	1.944	" 5	155.51
" 32	2.074	" $5\frac{1}{2}$	171.
" 36	2.333	" 6	186.62
" 40 (℈ij)	2.592	" $6\frac{1}{2}$	202.12
" 48	3.11	" 7	217.72
" 50	3.24	" 8	248.82
" 60 (℥j)	3.89	" 9	279.92
" 72	4.66	" 10	311.03

CANDY.

BY E. CUTTER, M. D.

So much has been written about the relations of candy to health, and particularly to diseased teeth, that it would seem presumptuous to add even a word. But supposing the question cannot be settled at once, there are some facts about candy, or sugar rather, which I have not seen mentioned in connection with the philippics against candy, or the arguments in its favor. As a *food*, it is a failure. The chemist tells us that the composition of cane sugar is $C_{12}H_{11}O_{11}$. The human body has some fourteen elements. How can three elements make fourteen? Dogs fed on sugar died in forty days. Their eyes ulcerated and came out. Dogs fed on nothing lived just as long. (Kirkes and Paget's Physiology.) The system has a natural loathing for food containing nothing but sugar. We pass then to the occasional use of sugar. Does it affect the condition of the organs of the body? Several years ago Dr. S. Weir Mitchell, of Philadelphia, proved that he could produce cataract of both eyes in half an hour, by simply injecting a teaspoonful of a saturated solution of sugar beneath the skin of a frog or Guinea-pig. Dr. B. W. Richardson, of London, has confirmed this, and these results are received by the medical profession as satisfactory. Now if a teaspoonful of sugar solution will make a frog or Guinea-pig totally blind in half an hour, can sugar be regarded as an innocent substance for young and growing persons, especially when they diet so largely upon white flour, which is chiefly composed of starch, whose chemical formula is identical with that of sugar? According to Dr. C. R. Agnew, of New York, out of 1000 children under 18 years of age, in a large school in his vicinity, 703 were found with defective organs of vision when examined with the ophthalmoscope. Have we a right to infer that sugar and starch diet have anything to do with this large percentage of deficient eyes? The experiments quoted show that sugar does act promptly, quickly, and terribly upon the substance of the crystalline lens of lower animals. Can we deny the probability of its action upon the eyes of human beings? Mark, we do not say it does thus act. We simply raise the question. We wish the State Board of Health would have it investigated, as it is a matter germane to their invaluable department of labor.

Now for candy and diseased teeth. Lime and phosphorus form the chief mineral ingredients of teeth. The organic matter (*i. e.*, that like sugar) amounts roughly to about twenty per cent. of the whole tooth. The mineral matter and water make the remaining eighty per cent. In other words, sugar gives the teeth, under the most favorable construction, twenty per cent. of its food only, when it is used as an aliment. But sugar cannot be used as an exclusive aliment, as death would ensue. Used occasionally when the other food has its normal amount of mineral ingredients, candy, when pure, probably does not harm the teeth. But used frequently, in connection with flour diet, there is no doubt that it will promote the decay of teeth. When organized substances are fed, they must receive all the elements that enter into their composition. Failing to receive these, their vitality is impaired and decay results. Teeth fed with candy do not receive any mineral elements. No phosphorus and no lime are found in candy, but they constitute the main part of teeth. Hence we see that candy and teeth are not interchangeable things, and that candy-eaters must not be surprised if their teeth fail.

When we remember that starch, a colloid, has to become sugar, a crystalloid, before it en-

ters the circulation, what has been said of candy may (excepting the subcutaneous injection experiments) be applied to starch.

Dr. Harriman, one of our Boston dentists, has given the writer the account of several marked cases where the disuse of flour was followed by a restoration of the teeth and an arrest of the decay, thus proving what a diet containing all the elements of the teeth will do for dental health. Those desiring sound teeth will then be in the way of obtaining and keeping them, if they eschew the excessive use of the carbohydrates, starch and sugar-candy.

A PHARMACEUTICAL FEAST.

The Glasgow druggists had a festival recently, and a local journal, the *Bailie*, gives the following amusing burlesque of the proceedings: —

"The members were not exactly in court dress, but in the fashion prevalent in the days of our grannies. Their heads were liberally powdered with magnesia, and their faces adorned with tiny bits of court plaster. The night was wet and boisterous, and on entering the spacious hall each guest was considerately presented with a warm cup of salts and senna. Some, however, preferred sulphur and treacle, while others took to Indian pink and cream of tartar. All the seats were tastefully decorated with Allcock's porous plasters, which had the effect of keeping the occupants cool and comfortable throughout the evening. Instead of the ordinary table napkin, a piece of sticking-plaster was neatly substituted, and so folded as not to destroy its adhesive properties, with a view to its being made useful afterwards, either as a gift to the Convalescent Home, or being sold to the Infirmary at cost price. The soups were served up in mortars, and dished with pestles; spatulas did duty for fish knives, scoops for spoons, and marble slabs for plates. Teetotalers had as many seidlitz powders as they could consume. Those of a more convivial nature, and they predominated, were freely supplied with steel and quinine wines of the rarest vintages. Jalap sauce and cantharides mustard added piquancy to the viands, and altogether the *menu* did ample credit to the established fame of the purveyor. A bust of Galen, with the time-honored symbol of the serpent twining round his temples, surmounted the president's chair. The walls were profusely ornamented with chest protectors, sponges, syringes, trusses, and other appropriate paraphernalia.

"Previous to sitting down to table, the company joined in singing 'Few are thy days, and full of woe.' After each course the countenance of every one looked so unspeakably wretched that the waiters — the oldest and most grave-looking saulies in town — were obliged to turn their backs to hide their gruesome smiles.

"When the cloth was removed, the chairman in a few well-chosen words alluded to the prosperity of the trade (A voice: 'Profession') and particularly to the foresight displayed a year or two ago, when coals were dear, in doubling their charges for prescriptions and medicines generally, a movement in the right direction, which had raised their profits from 100 to 300 and 400 per cent. 'And why not?' he triumphantly asked. 'Were they not public benefactors? The public could not live without them; they could not even die without them.'

"Songs and recitations followed, the celebrated gravediggers' dialogue in 'Hamlet,' 'Death and Dr. Hornbook,' 'We're wearin' awa, Jean,' and other lively pieces being feelingly rendered by members of the company.

"An assembly wound up the entertainment, the chairman leading off with St. Vitus's Dance. After fortifying themselves with cork soles, chest protectors, warm plasters, respirators, and jugs of hot gruel, each took his several way and hurried home."

MEDICAL MEMORANDA.

Strong Solution of Salicylic Acid. — A writer in *New Remedies* remarks that various solvents for this substance have from time to time been proposed, such as phosphate of soda, phosphate of ammonia, and borax; but none of these yield a very strong solution. "The demand for such a solution (aqueous) having arisen, we were compelled to search for another substance — neutral, and itself not irritating — which might take up a large quantity. We finally succeeded by the use of acetate of lime. Introduce 31.1 grams (℥ i.) each of salicylic acid and acetate of lime into a half-pint bottle, add about 118 cc. (℥ iv.) of water, and shake well until the salicylic acid has been thoroughly incorporated with the water. Then add 29.5 cc. (fl. ℥ i.) of glycerine, and finally enough water to make up the bulk to 236.2 cc. (Oss). Immerse the bottle to the neck in boiling water, and remove it from time to time to agitate the contents. In the course of about fifteen minutes solution will have taken place, and it remains permanent on cooling. In order to prevent water from being spattered into the bottle from the outside, we are in the habit of slipping a perforated rubber nipple over the neck, which allows the vapor from inside to escape, and the orifice of which is too small to allow access of any liquid from without."

Soluble Glass in Hospital Construction. — Dr. D. Luther, in an article in the *Philadelphia Medical Times*, suggests the employment of soluble glass in hospital construction. In the building and arrangement of institutions, particularly those for the insane, no system of ventilation or arrangement of the apartments occupied by such patients, whether of wood, painted or oiled, or with floors of slate, metal, or cement, has been sufficient to effect entire cleanliness. A material having an entire absence of absorbing surface would seem to meet the demand in such cases, and glass is such a material. The walls, floors, and ceilings might be covered with it. It is not expensive, is strong when sufficiently thick, is impervious to water and dampness, and can be made of suitable color. Apartments thus fitted up could be thoroughly drenched with water so as to remove every particle of fetid matter. The floors could be made comfortable by covering them with rubber cloth, which, with the bedding, could be easily removed and cleansed.

Diseases among School Children. — The *Philadelphia Reporter* says that the Rhode Island Medical Society, at its late meeting, gave considerable attention to the causes of disease among children in the public schools, and the members were generally agreed that it is due not so much to hard study as to bad ventilation and other causes, one of which is hereditary or acquired predisposition for disease; that normal activity of the brain is helpful to the best health of individuals, and that judicious study in school is by itself a healthy functional exercise. They declared, however, against long hours of study, and finally adopted a resolution declaring "that among the most prominent causes of ill health among pupils while attending school we must recognize the following: Attending balls and parties, sitting up late at night, eating improper food, drinking tea and coffee, and especially reading works of fiction." We have no doubt that this opinion will be generally indorsed by medical men in all parts of the country, and we know that it expresses the views of our best teachers.

The Value of Medicines. — The *London Lancet* thinks that there is a tendency to undervalue rather than overvalue medicines at the present time. "We are not converts," writes the editor, "to the mint-water treatment of acute rheumatism. If we have lately made fresh discoveries of the curative powers of nature, we have also made fresh discoveries of the curative powers of medicine. Is it conceivable that such powers should not have applicability to the temporary aberrations of nerve-function which constitute so much of the disease that comes before us? Where is the justification of speaking disparagingly of medicine, when it reduces temperature; when it dilates a pupil or contracts it; when it removes pain as by a magical process; when it alters the complexion and the composition of the blood; when it modifies the capacity of the cavities of the heart and the calibre and the contents of the various tubes of the body, such as the bronchi or the bowels or the blood-vessels; when it removes nodes; when it stops hæmorrhage, or alters in twenty-four hours the whole aspect of a skin eruption; when it suspends indefinitely epileptic seizures; and when it induces sleep? When medicine can be shown palpably to have such powers, it is but reasonable to expect year by year the discovery of new uses of it in the treatment of disease."

A Recipe for Curing a Taste for Liquors. — At the festival of one of our reformatory institutions, a gentleman is reported to have said: "I overcame the appetite by a recipe given to me by old Dr. Hatfield, one of those good old physicians who do not have a percentage from a neighboring druggist. The prescription is simply an orange every morning, a half-hour before breakfast. 'Take that,' said the doctor, 'and you will want neither liquor nor medicine.' I have done so regularly, and find that liquor has become repulsive. The taste of the orange is in the saliva of my tongue, and it would be as well to mix water and oil as rum with my taste." The recipe is simple, and has the recommendation that it can do no harm even if it does no good.

The Receipts of a Famous Physician. — The London *Medical Press* gives this extract from the diary of the late Mr. Mewburn: —

"The following statement from the fee-book of Sir Astley Cooper is curious: —

"'My receipt for the first year was £5 5s.; for the second, £26; the third, £64; the fourth, £96; the fifth, £100; the sixth, £200; the seventh, £400; the eighth, £610; the ninth, £1100.'

"In 1815 Sir Astley made £21,000! A Mr. Hyatt, an ancient merchant, gave him £1000 on recovery under his care; and Mr. Coles, of Mincing Lane, for a long course of time gave him £600 every Christmas."

To Cure Nail-Biting. — Children often get into the bad habit of biting their nails, and it is not wholly unknown among those of larger growth. A correspondent of the *British Medical Journal* having asked for a cure for this habit, a reply was given, suggesting the application of styptic colloid (tannin in collodion) in a thin line at the end of each nail. It dries quickly, forming a film, the bitter taste of which acts as a reminder. It must be reapplied whenever the hands have been washed.

A Sign of French Progress. — The *British Medical Journal* says that the Bureau Municipal des Nourrices, that huge, ancient, and costly institution by which the municipality of Paris "assisted" the *bourgeoises* to find wet-nurses in the country for their children, is about to disappear. The cost of maintaining it last year was 500,000 francs ($100,000) and the mortality of the unhappy children whom this singularly French institution "assisted" to separate from their parents varied from 45 per cent. downwards. It may be hoped that French mothers of the middle and upper classes will learn more and more to perform their natural duty of suckling their children. In that case, we shall hear less of the depopulation of France. This institution is upwards of a century old; its disappearance is a very healthy sign of national progress.

OPIUM SMUGGLING. — Among the recently discovered methods of smuggling opium, the *Alta California* gives the following: It has been hidden in false bottoms of coffee kettles, used on the voyage; in tinners' pots, which are brought ashore on the backs of passengers; in old pieces of timber, about six inches wide, of the same depth, and four feet long, in which places are cut out just large enough to hold five-tael cans of opium. These timbers are generally brought ashore by some of the crew for the purpose of leading the officers to believe that the wood has been brought from the ship and is of no further use. Another plan was to bring a carpenter's horse on to the wharf, until one day some inquisitive inspector took a notion to carefully examine the horse, and, sure enough, had his trouble rewarded by finding slides in the legs, in which taels of opium had been stowed away. Still another mode was to have tin boxes fitted around the calf of a man's leg, which were filled with opium.

SALICYLIC ACID IN DYSENTERY. — According to the *New York Medical Journal*, cases of acute dysentery have been treated satisfactorily in that city by means of doses of thirty grains of salicylic acid administered three times a day. The only objection to the remedy appears to be a slight irritation of the stomach, but this is not sufficient to cause emesis.

CONCERNING GLYCERINE. — At a recent meeting of the Chemical Society, in London, Dr. Armstrong exhibited a specimen of pure crystallized glycerine from Messrs. Dunn & Co., of Stratford, a portion of a bulk of 40 lbs. The crystallization had been induced by exposure to the cold of the early part of January, combined with the agitation of a journey by rail. Dr. Odling, remarking on the rarity of this product, recalled the fact that another specimen had been shown there some years previously by Dr. Gladstone. It had been produced under similar circumstances. Mr. J. Williams said he had found hydrocyanic acid to be a very delicate test for the purity of glycerine. If the glycerine were perfectly pure, the mixture might be kept for a twelvemonth without change, whilst a slight trace of impurity in the glycerine caused the mixture to assume a yellow tinge in a short time.

GLYCONIN. — The formula for the preparation of glyconin in the last number of the JOURNAL (page 108) was given as it appeared in the *Druggists' Circular;* but it would be better to state the proportions of glycerine and yolk of egg as five parts by weight of the former to four parts by weight of the latter. Glyconin is used in the French hospitals as an application in burns, erysipelas, etc., and as an article of diet.

INJECTION OF ACIDS INTO THE VEINS.

AN interesting paper on this subject was recently communicated to the French Academy of Sciences by Dr. Oré. After remarking that injections of chloral into the veins had now been practised by a great many surgeons and experimentalists, and that, if that agent admitted of being directly introduced into the circulation, it was because of its being completely soluble in water, he proceeded to say there were certain substances that it would be desirable to bring into immediate contact with the blood, but they were not soluble, and could become so only under the influence of acids or alcohol. Now we had long been taught that blood coagulated by contact with those agents; would it not therefore be imprudent to employ them in order to impart solubility to other substances one might wish to introduce into the current of circulation? Dr. Oré was hereby led to inquire whether this coagulating property really existed in acids and alcohols. He accordingly injected 12 grammes of a mixture of equal parts of concentrated vinegar and distilled water into the central vein of a middle-sized dog. The operation lasted 30 seconds, and produced no effect whatever. The experiment was repeated with different doses on the same day, without inconvenience, and without any coagulation of blood. So far, therefore, as vinegar was concerned, the results were absolutely negative. It remained to be seen what would be the effects of powerful mineral acids. Dr. Oré injected 2½ grammes of sulphuric acid diluted with 24 times its weight of water into the crural vein of the right leg of a large dog. The quantity injected was 45 grammes. The subject evinced agitation, and breathed faster during the first five minutes, after which it returned to its usual state of tranquillity. Four days after, being in perfect health, it was killed and examined: there was no coagulation and no inflammation of the tissues, although a drop of the above mixture will hiss when it falls on a marble slab. Similar experiments were made with alcohol, phosphoric, nitric, and hydrochloric acids, and always with the same results. It may therefore be safely concluded that, although acids coagulate the albumen of blood in open vessels, they do not do so in the veins.

DENTAL RECIPES.

TOOTHACHE DROPS. — The two following mixtures are recommended by Dr. Holderness in the *American Journal of Dental Science:* —

(1.) Saturated solution of carbolic acid,	
" " of chloral hydrate,	
Compound tincture of camphor,	
Fluid extract of aconite	āā 1 ounce.
Oil of peppermint	4 drachms.
(2.) Hydrate of chloral	1 drachm.
Water	4 drachms.
Tincture of aconite (Fleming's)	15 drops.
Chloroform,	
Ether,	
Alcohol	āā 20 drops.
Acetated tincture of opium,	
Oil of cloves	āā 2 ounces.
Camphor	90 grains.

TOOTH WASH. — We find the following in the London *Chemist and Druggist:* —

Potass. carb.	½ oz.
Mellis	4 ozs.
Spt. rect.	2 ozs.
Aqua	10 ozs.

Flavor to suit.

CINCHO-QUININE.

As the following emphatic testimonial to the value of this agent contains matter of practical interest to the profession, we print it in full: —

NORTH EASTERN FREE MEDICAL DISPENSARY,
908 E. CUMBERLAND ST., PHILADELPHIA, PA.,
February 29, 1876.

MESSRS. BILLINGS, CLAPP, & CO., — I send you a few plain, matter-of-fact words in relation to the value of the Cincho-Quinine as I have found it to be after a thorough test. I will here state that at the dispensary, out of over 8000 patients treated during the past year, I find quinine was administered as whole and part treatment in over 3000 cases, clearly demonstrating the malarial influences existing. The test was given the Cincho-Quinine in this way. Taking 240 cases as they applied for treatment, where quinine was indicated, each alterative patient was given the Cincho-Quinine, with the following results.

Its febrifuge, tonic, and antiperiodic effects equalled those of the sulphate, and when administered with an intention of producing invigoration and tonicity of the nervous system, as well as to increase muscular force, the Cincho-Quinine may be given for greater length of time, and even in larger doses, than the sulphate.

Its power to strengthen the pulse was not as well marked upon its early use, but later appeared prominent, even in several cases where gastro-enteretic irritation existed, where the sulphate would have been considered inadmissible, unless combined with morphia, etc.

The Cincho-Quinine produced no unpleasant results, as I could perceive. A large number of those to whom the sulphate was administered (officinal doses) experienced either headache, sickness, or irregular action of the bowels; while upon the other hand not one case was so affected by the Cincho-Quinine.

In many cases of periodicity the Cincho-Quinine was given in very large doses, oft repeated, and continued for days, without producing the very unpleasant symptoms which would have undoubtedly occurred if the sulphate had been used to such an extent. The result was most gratifying not only to myself but also to the patients.

Where ℈i. to ℥i. doses were given, such symptoms as pain in stomach, giddiness, flushed countenance, apparent distention in the head, palpitation, blindness, delirium, numbness of feet, deafness, vomiting, etc., did not appear, some of which would follow the use of the sulphate in such large doses.

In typhoid and typhus fevers I always prescribe the Cincho-Quinine in conjunction with other appropriate medicines, the result being as favorable as with former cases where the sulphate had been used. Not only in cases of fever, but I have also tried the Cincho-Quinine in all cases where the sulphate is recommended, such as rheumatism, neuralgia, debility, convalescence from acute and chronic diseases, dyspepsia, dysentery, etc., either alone or combined with other medicines, as the case may require, and with equally good results. Combined with morphia physicians will find it a most valuable remedy for those troublesome diseases, epilepsy and delirium tremens. The following prescription has, in my hands, proven almost a specific for dysmenorrhœa:

Cincho-Quinine	℥j.,ℨj
Cimicifugin	grs. xviij.
Ext. stramonium	grs. vj.
Sacch. alb.	grs. xxiv. M.

Ft. pulv. et in chart. xxiv. dividenda. Sig. One, three times a day, commencing ten days before the expected time, continuing during the first day of the period.

I intend giving the Cincho-Quinine a trial in some cases where I have used the sulphate externally, as gargles, etc., with success, and will write you the result some future day.

J. A. GAMAGE, M. D., Supt.

PREPARATIONS OF IODOFORM.

DR. J. H. JOHNSON, of Providence, R. I., sends us the following note: —

Since the article on iodoform appeared in the February number of the JOURNAL, so many letters have been received from your readers, in the profession, requesting the formulæ for the glycerole of iodoform and the iodoform suppositories, as I use them in practice, that I inclose them for publication: —

Iodoform Suppositories.

Iodoform (in powder)	gr. xxx.
Oil of theobroma	℥ vij.

Triturate the iodoform with half a drachm of the oil, add to the remainder the oil previously melted, and make six suppositories.

Glycerole of Iodoform.

Iodoform	gr. xxxx.
Glycerine	℥j.

Triturate the iodoform with the glycerine.

The suppositories have proved very efficient in inflammation and induration of the womb. The glycerole of iodoform, employed for the same purpose, is applied upon pledgets of charpie, saturated with the medicament.

WANTED. — Numbers 1 and 5 of Vol. VII., and numbers 3, 4, 5, 6, 7, 8, and 9 of Vol. VI. of the Boston Journal of Chemistry. Address, with terms, etc., B. C. E., care Boston Journal of Chemistry.

WANTED. — Numbers 4 and 5, Vol. VII. of the Boston Journal of Chemistry, dated October and November, 1872. Must be in good condition. Address, stating price, Ottomar Jarecki, Erie, Pa.

Boston Journal of Chemistry.

VOLUME X. BOSTON, MAY, 1876. NUMBER 11.

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Familiar Science.

BOULDER ROCKS.

THE following is an extract from the address by the editor of the JOURNAL, delivered before the Massachusetts State Board of Agriculture at Haverhill, December 2, 1875. It was delivered extemporaneously, without notes, which accounts for the unstudied, familiar style of the address. It is preferred to present it as printed from the stenographer's notes, rather than to make it more formal and exact by revision and changes.

"I have already observed that the constitution of boulder and all other rocks is very simple. There is a vast number of different minerals found in our cabinets, but they differ only in the proportions of a few elements, and in crystalline structure. Granite predominates in the rocky framework of our globe, and consequently in the boulders we find this class of rocks by far the most numerous. In the drift or boulder rocks of this State, more than half are granitic in structure.

"Before passing to consider kinds of rocks, let me ask and briefly answer the question, What is the nature of a rock? Rock is dead inorganic matter, burnt-out material which is incapable of any change other than disintegration by chemical or physical causes. It is the coke remaining from the combustion of a world, to use another and perhaps not quite scientific comparison. Rocks are bodies saturated with oxygen, and therefore are at rest.

"Plants differ from rocks in a wide degree; they are composed of matter in a state of unrest. They possess a principle which is called vital force, and which leads to constant change until a state of maturity is reached, when, owing to the waning of the vital forces, the antagonistic chemical forces step in and produce decomposition and decay. A plant is under the protection of vital forces during the term of its life, and it has powers of resistance sufficient to keep at bay all oxidizing or chemical agencies, until the time comes when it must be resolved back to earth and air, from which it came. Rocks by disintegration and chemical change become the food of plants; that is, the mineral elements are lifted, as it were, by the aid of vital force into the structure of plants, and they become integral portions of plants. They thus subserve a most important office, dead, inert, and useless as they seem to be. They encumber our farms, mar the beauty of our fields, break our ploughs and harrows, and cover soils which might be devoted to wheat and corn; we scold at their presence, but let us remember that it is from these hated masses that the very pabulum of our cereals is derived, that it is due to them that there is anything to cultivate in our fields.

"The kinds of rocks found in our fields in Massachusetts which belong to the drift period are, as I have said, not numerous. Granite of different varieties and colors prevails most extensively; next come quartz, talc, gneiss, and the iron-stones. The latter are found to be quite abundant in the northern counties of the State. In these stones, sulphide of iron forms a prominent ingredient, and when they are taken from the ground and exposed to the action of the air, chemical change ensues, and oxide of iron is formed upon the surface, giving to the stones a reddish hue. This kind of rock is very undesirable for building purposes, and should be avoided. The stone, when split open, affords to the inexperienced no special evidence of the presence of iron, and in spite of the care exercised in the construction of my buildings, several of these stones got in place in the walls, and already are covered with rust. Paint will be needed to protect them from further action.

"In illustration of the singular variety and juxtaposition of rocks found upon my farm, I desire to call your attention to the two varieties which I hold in my hands. One is a fragment split from a boulder weighing perhaps five tons, and is very nearly pure quartz; it is white and beautiful. The other is a granitic iron-stone, broken from another boulder of equal weight, lying perhaps about two rods distant from the quartz boulder. How different are those specimens physically and chemically! I have here other specimens which more fully illustrate the dissimilarity in the boulder rocks found at my farm. These rocks serve to impress upon our minds the conviction that they do not belong to any one locality, but have been brought from different, and in some cases distant points, by an agency of the nature of which we have no positive knowledge. Finding, as I have, specimens of talcose slate at the farm, of a variety which is supposed to be peculiar to the mountains in Northern New Hampshire, I am led to ask, By what agency was this rock transported from those distant localities? It certainly could not have come by human hands. The same question may be asked of the granites, the quartz rocks, etc. From whence came they, and how?

"I have said that we have no positive knowledge of the method by which these rocks have been deposited upon our farms; but we do have very plausible and reasonable theories, which in a measure satisfy our inquiries. These rocks afford evidence, not only that they have been broken from bed-rock at distant points, but also that they have been subjected to some grinding, polishing force, long continued. You observe upon this rock which I have in my hands groovings and striations which could be caused only by its having been forced over another and harder rock, in some movement to which it has evidently been subjected. This stone I picked up on my hill, as it was thrown out of a trench by workmen, and it is only one of hundreds I have found, bearing similar markings. In the larger boulders, which are imbedded in the soil, I find these groovings to have determinate positions; that is, the lines run for the most part in fixed directions, usually north and south, or perhaps northeast and southwest, showing that the movement in which the rocks were involved was from the north towards the south, in general.

"You observe, further, that these boulders have been nicely polished upon their surfaces, and the edges so ground down and rounded that they resemble the stones we find upon sea-beaches which have been under the action of the waves for long periods of time. All these facts and appearances point to the action of water, or, more distinctly, to the action of ice and water. Now, as I find these rocks upon a hill one hundred and twenty-five feet high, or that height above the surface of Lake Kenoza, the question arises, How could water and ice reach that point to exert such extensive influences upon the hard surfaces of rocks? This inquiry leads to a brief consideration of a period in the history of our planet known as the great Ice Age, which is supposed to have existed during a portion of the post-tertiary period.

"Assuming that the boulder rocks upon my farm, and upon your farms, gentlemen, have been brought by the agency of ice to their present positions, let us inquire as to the area over which this movement extended.

"If we look at the map of the United States, and survey all that immense extent of country north of the line of 40°, we obtain some idea of the magnitude of this movement, so far as North America is concerned. The area covered by drift includes the whole of New England, New York, Pennsylvania, Ohio, and some of the Western States. All over this section we find these boulder rocks, and in association we find immense deposits of gravel, slate, sand, and clay, all mingled in a homogeneous mixture, with the exception of the blue clay, which usually forms a distinct layer. A theory formerly prevailed, and is even now entertained by some geologists, that this portion of our country has been submerged; that the sea, or salt water, covered the whole of this vast area in a comparatively recent geological period; and that floating icebergs, coming from the north, were the carriers of these stones, gravel, etc. It is undoubtedly true that icebergs are capable of transporting stones, and do transport them long distances in our own period, but this theory does not account for all the observed facts. There are certainly a great number of difficulties in the way of the adoption of this hypothesis. In the first place, there is not evidence sufficient to prove that the New England States, or any of the Northern States, have been covered with salt water since their upheaval, or certainly not since the post-tertiary period. We find no marine shells or ancient beaches, no evidence of the existence of cretaceous deposits, in any of the northern sections of our country. If seas had prevailed here, these evidences of the fact would most certainly appear. What is known as the glacial theory much more satisfactorily clears up the mystery, and sheds light upon the interesting problem. It is supposed that in a remote epoch of the earth's history the whole northern sec-

tion of our country was covered with a vast sheet of ice; that this icy covering moved down from the north in accordance with the laws governing the movements of glaciers, and brought along with it the vast accumulations of boulders and drift material which we find everywhere deposited.

"If this be true, curiosity may lead you to inquire how far these materials have been transported, and how long the ice continued. The first question can be answered approximately, the second rests upon hypothesis. Observed facts show that some of these materials have been transported ten, twenty, fifty, and, in some cases, one hundred and fifty miles. I have before alluded to this point, and will not dwell upon it longer. It is supposed the ice-covering continued through a period of at least one hundred thousand years, and that it commenced about two hundred thousand years ago. This is, however, pure speculation. Now, this sheet of ice must have been of immense thickness, for it has left evidence upon the sides of our mountains of this fact.

"Professor Dana says that it could not have been less than five thousand feet in thickness in the more northern portions of New England; and in the southern portions, it was probably two thousand feet. There are certain facts which lead us to believe that this view is correct, for the ice must have covered very nearly the whole of the mountain regions of New Hampshire. Only about one thousand feet of Mount Washington was left uncovered; and the whole of Monadnock and the Green Mountains of Vermont were hidden by the ice. The same may be said of the mountains in the western part of Massachusetts, and those in the Adirondack region.

"Whenever, gentlemen, you visit Monadnock, a mountain which is quite within the field of vision from the hills around this city, you will find, upon the northern and northeastern sides of it, evidence that it has been subject to very severe ice action. It has been torn, and bruised, and scored by the action of moving ice; and you will find the same thing true, to a considerable extent, in the New Hampshire range of mountains. You will find that their rocky sides, at elevations of a thousand, two thousand, and five thousand feet above the valleys, afford evidence of rough usage from this descending mass of ice. At this stage of our remarks, you very naturally inquire, How came this frigid condition to prevail at this particular epoch in the history of our planet? To attempt to answer this question would lead me into a field of speculation in which we might wander for a great length of time. Some most ingenious and plausible theories have been advanced to account for the great reign of ice, but I have not time to present them for your consideration this afternoon. I will simply remark that evidence is afforded that there has been more than one glacial period, and that another is not improbable; but the time for it to commence is so remote, I think we may venture to plant our corn as usual, without fear of having to dig for the crop through a covering of ice.

"The moving of glaciers is a puzzle to many, and therefore I will briefly allude to this point. The motion of the great northern glacier which brought to us the boulder rocks was probably exceedingly slow. It moved down from the north, taking our valleys and river-courses in its path, and so great was the propulsive force that it glided over the hills and lesser mountains without difficulty; nothing could obstruct its onward flow. We get a very correct idea of the movements of ice from a study of the glaciers which exist in Switzerland at the present time. I suppose it may be a novel statement to some, when I tell you that at the present time more than 1500 square miles of Swiss territory are covered perpetually with ice, and the whole of the land north of the lower quarter-section of Greenland is also covered continually with solid ice masses. The same conditions exist in Greenland to-day, so far as glacial action is concerned, that existed here thousands of years ago. Now, if we have glaciers existing at the present day, and if we study their action, we must obtain some knowledge as to their movements and laws, which will throw much light upon the subject.

"But it is not necessary for us to go to Greenland or Switzerland to study glacial action, for we have glaciers in our own country. They are found in the northern part of California; we have them existing upon the sides of Mount Shasta, which rises to the great altitude of 14,000 feet. We also have them in Colorado; and there we find one of the most remarkable exhibitions of the erosive action of ice which can be found upon our globe. According to the report of the United States Surveying Expedition, under Lieutenant Davis, he discovered a vast channel in the side of one of the Colorado mountains, which the ice had cut down through solid rock. The walls upon either side are more than one thousand feet deep, and they extend down nine thousand feet into the valley below.

"It is, however, in Switzerland that ice movement has been systematically and fully studied. Prior to 1827, there was but very little known regarding the motions of glaciers. During this year, observations were made in Switzerland which proved conclusively that these masses of ice, which extend up from the valleys on to the mountains, were in a state of constant motion. If you start from the little town of Meyringen and go up the Hasli Valley, following the Aar River, you soon come to the Handeck Falls. At this point, by turning to the right, you will reach a glacier which possesses very great interest. It is the one upon which the first observations were made by any competent observer. Three years ago I followed this route to reach the glacier. In 1827 a French *savant* visited this glacier, and erected upon it a little hamlet, and resided there and made observations continuing through several months; and after he left it, it was not visited again until 1830. When Professor Agassiz first began his studies, he went up through this valley and reached the glacier in 1830. He found that from 1827 to 1830 the little hamlet had moved 327 feet down towards the valley. Ten years later, in 1840, the same structure had moved 4000 feet. This proved conclusively that glaciers moved, and experiments were undertaken by Agassiz and others to ascertain the rate of motion; and the devices for obtaining this knowledge are now so perfect and delicate that it is not necessary to wait a year to prove that a glacier moves. By the use of a theodolite and other modern appliances you can ascertain the distance which a glacier moves in a single day, — yes, in a single hour. They move with different degrees of rapidity; they move as a river moves in its channel.

"In two visits to the glaciers of Switzerland, I have had opportunities of observing this most interesting phenomenon of ice movement, and I know of nothing upon our earth that awakens in the mind a greater degree of awe and solemnity than these great glaciers. As you walk upon the sea of ice, the cold, the solitude, the absence of all life and vegetation, the deep silence which reigns, — only when those deep detonating noises are heard echoing among the rocks, which proceed from falling masses of ice, or from the cracking of the main body, — all these awaken in the mind a high degree of awe, and almost of terror. The motion of a glacier is greater in the centre than it is upon the sides. If a line of stakes is placed across a glacier, we find that the rate of travel in the centre is more than double that upon either side. The ice-stream obeys the same laws in descending from a high altitude to a plain that water does, and it is held in check and diverted from its course in the same way. Vast quantities of rocks, pebbles, sand, etc., are brought along and piled up by the sides of the glacier, or at the point where it terminates in the valley. These deposits are called *moraines*, and are often of great extent, forming high hills and ridges. It is probable that some of you have visited the great glacier which descends from Mont Blanc into the Valley of Chamouni, in Switzerland, and observed the terminal moraine formed at the point where the ice melts as fast as it descends. This is an interesting object, and illustrates forcibly the great power of ice action. Imbedded in this moraine are seen huge boulder rocks, which have been detached from the surface of the mountain thousands of feet above the valley, and slowly brought down and deposited by the melting of the ice. It is in this way, probably, that the boulder rocks upon our farms have been transported from distant points. Slowly, through the long ages of the post-tertiary period, they moved down from the north, imbedded in the thick ice, and, by being forced over other rocks, and ultimately coming under the action of water, as the ice melted, they have been rounded and polished, many of them, in a remarkable manner. We find ancient moraines existing all over the Northern States; and there is good reason for believing that the long ridge of hills, upon one of which I have placed my stone buildings, in the rear of this city, is an ancient moraine. The nature of the deposits, and the formation and arrangement of the hills, lead to this conclusion. There were no lateral or medial moraines formed during the glacial epoch, only terminal moraines; and such, of course, is the one to which I have alluded.

"Now, gentlemen, from the statements and facts which I have most imperfectly and briefly presented, some idea may be obtained of the probable origin and history of our boulder rocks. There is no other theory which will satisfactorily account for their presence but the one presented, and we may regard it as true until a better one is brought to notice, one more in consonance with observed facts around us. This knowledge cannot but help to increase our interest in these stranger rocks, and lead, not only to their further study, but also to the study of our soils, so intimately connected with them."

WHAT CHEMISTRY HAS DONE.

Dr. J. L. W. Thudichum, in a recent lecture "On the Discoveries and Philosophy of Liebig," delivered before the Society of Arts in London, referred as follows to the position which this latest born of the sciences has already attained: —.

"The youngest of the sciences or the youngest branch of science is chemistry, founded by Lavoisier and Dalton; developed by thousands of clear heads and nimble hands, it has in half a century become a recognized power in the affairs of man. It has materially improved his estate, and enlarged his mind to conceptions of an elevating nature; it has become a ready test of his reasoning and working power. It has become the handmaid of almost all the elder sisters: of astronomy, teaching the composition of distant stars; of geology, teaching the composition and changes of strata and minerals; of physiology, vegetable and animal, teaching about food, nutrition, growth, changes, death, and decay; of the healing art, teaching the nature of evils in the shape of disease, and the means of curing or mitigating them. This science, too, was developed by work, — work physical and mental; its ways were often rugged, its endeavors misapprehended, opposed, suppressed. And the great men whose names are inscribed upon the roll of its principal promoters will be considered by posterity as benefactors akin to Hercules, removing evils, establishing the good and true. If we cannot now inscribe

their names and likenesses amongst the stars, and transfer them to an Olympian abode, yet we can honor them by admiring their works and lessons, by sharing and continuing their work, by, as it were, living their lives with them over again, and thus prolong their memory forwards while we prolong our own in the inverse direction. We ought to honor them out of gratitude no less than out of the desire to benefit continuously man's estate."

HOUSEHOLD TASTE.

I.

THE modern house is filled from cellar to attic with various forms and styles of furniture, the floors are covered with carpets of divers colors and materials, and the walls are hung with paper, or painted; all at a considerable cost of time and money, and with the hope doubtless of some adequate return. It may be well to inquire how far this hope is realized.

The residence of a reasoning being should be furnished and decorated, first, to give the greatest amount of health, comfort, and convenience for the outlay, and to necessitate the least labor possible for its care and maintenance; secondarily, to indicate by design and arrangement the uses for which it was intended, and to gratify the taste of its occupants by constantly keeping before them graceful forms and fit and harmonious colors, which may gladden their lives and make the home attractive. These reasonable requirements are seldom even in part satisfied. Most rooms are furnished without any regard to good taste, with very little for real comfort, and as though purposely intended to make work for the household drudge. For the justification of this lack of common sense and good taste the two reasons most often given are that the furnishers "know what we like," or that the style has the approval of "Mrs. Grundy." In short, to strip these two of all disguises, we have for real reasons *bad taste* and *fashion*.

With the bad taste little can be done hastily; patient teaching and sober reasoning, and the multiplication of good examples to offset the bad, may do much. But for that "deformed thief Fashion," his control of household art is lessening day by day. Vulgar and ostentatious display, the dress or house overloaded with meretricious ornament (which is used to cover deformity as rank perfume is used to cover dirt), these rude and boisterous displays of bad breeding are steadily growing into disrepute. Still, to free the shops and houses of the accumulated deformities of the last fifty years is no easy task. Many people cannot afford to begin furnishing anew, and even if they could, it is doubtful if art education has progressed sufficiently to make the popular taste a safe guide. This is shown in the attempted introduction of the Gothic furniture called by upholsterers the "Eastlake style." Mr. Eastlake advocated simply a return to the honest construction and correct principles of decoration of hundreds of years ago. Many of his blind disciples forget the principles, misapply the ornamentation, and produce hybrid monstrosities nearly as remarkable as their predecessors for ugliness and falsehood. But even these failures are a step in advance, for the forms are simple, and they save labor in the care of a house; and being partial copies of good models they are to some extent fitted for ordinary use. But the employment of this, as of preceding styles, may be traced rather to a passing fashion than to any real development of correct taste. Viollet-le-Duc tells us, "Those who truly love art do not exhaust themselves in search after novelties; for them good things are always new and always admirable."

Let any one who has a house to furnish, even if it be but a small and inexpensive one, begin by giving each detail careful consideration in the light of reason and such taste as he may be gifted with, aided by such expert advice as is available. The result cannot fail to be more or less good, although the limitation of means may force the adoption of many things not altogether fit. Most people cannot of course have furniture built "to order," but our dealers would not put such work as they do upon the market if no one bought except under protest and all asked for something better.

Supposing a house to be built, bought, or hired, and to be with bare pine floors, painted pine finish and doors, and bare plaster walls and ceilings. Of course most would like hard-wood finish and floors, dadoed walls, and other luxuries; but one can do very well without. Let us begin where furnishing should begin, with the selection of the carpet. Woolen carpets are dusty and unhealthy nuisances, and it will be a "red letter day" in house furnishing when they give way to smooth, clean floors, with soft rugs for winter and hard boards for summer. But at present one must compromise. The pine floors, if good, may be painted or stained, plain or in patterns, with borders; all being in sober, quiet tints. Then a large rug may be made of any carpeting, with a border of plain color (if nothing more elaborate can be afforded or is required), and this rug, being from one to three or four feet smaller than the room all round, may be fastened down with loops and hooks or other simple contrivances. Thus arranged it can be hustled out in five minutes, whenever "its room is better than its company."

The next step is to select the pattern for the carpet; and here is an important point for the display of taste. Common sense will teach that as a floor is made to walk on, things on which one should never tread are utterly out of place when portrayed on a carpet. Patterns in high relief (that is, with apparent projection and shadows), dogs, babies, horses, ribbons, bouquets, ermine, buildings, and all such matters, have no fitting place under foot. If there be figures to a carpet, they should be small geometrical ones, or conventionalized plant forms in a "glowing neutral bloom," or of a mixed effect of grass, heather, flowers, earth, and moss tints, with no one form or color prominent. When examined closely the figures should be found not tending all one way, but radiating from centres or lost in a general intricacy of pattern which will guide the eye in no particular direction. In short, the carpet should be rich and full in color, but not obtrusive or decided; for it is to serve as the earth to be walked on, and to form the lower background for human figures and for furniture. Any to whom this description conveys no adequate idea, or who wish to pursue the subject further, would do well to examine carefully some of the Indian, Persian, or Turkish rugs and carpets. The best of these are exquisite lessons in design, though too costly for many to own. The articles on "Carpet Design," by Dr. Dresser, in "Cassell's Technical Educator," are also within reach of nearly every one, and treat the subject very plainly and fully. Before leaving the matter it is well to note that for chambers lighter and more delicate colors and fabrics are appropriate for floor coverings. Straw mattings, India rugs that will wash, and various other materials may be used. But for health there should be nothing in a sleeping-room that cannot be readily removed and cleansed; the ordinary woolen carpet, nailed down, is specially to be condemned.

The floor completed, the walls require our next consideration, and applying reason to them we find that they are to serve as a background for people, pictures, and furniture. Remember, they are to serve as a *background*, and of course no one desires a background to insist on coming to the front. But this is exactly what they do in many cases. The staring colors, the distracting, sprawling figures that disturb your sick hours with sicklier fancies, and all such misplaced and "loud" effects tend to continually harass instead of soothing you. In a glen of the woods (an apartment of Nature's own ordering) you will find a carpet of mosses, grass, and humble flowers, all softly blended together; a wall of solemn gray tree-trunks with cool and quiet shadows; and higher up light foliage; and overhead the pale blue sky. So for a peaceful and restful room you follow the general order of nature without trying to imitate exactly in detail effects which you can never hope to rival. Let the carpet be rich but not gay, and with colors and forms well mingled. Have the base or mop-board of a dark, dull shade, a dado paper somewhat lighter in tone, and a middle paper (extending perhaps three quarters of the way to the ceiling) of a sober gray, a sage green, or a dull maroon tint; broken, if you like, by some figure in a shade of the same color, but not too pronounced. The picture moulding should be put at the top of this middle paper, so that the step-ladder and risks of falls and bruises need not be accompaniments of picture hanging. The pictures should be hung on a level with or a little above the average height of the eye when the spectator is standing. The space above this moulding may be covered with a much lighter paper, even approaching to white, and with delicate effects of gilt or silver in the figure if desired. The plaster cornices and ceiling should be colored in very pale shades of pearl gray, cream-color, blues and buffs, or other suitable tints. The whole effect may be very much enriched, and somewhat stronger colors and gilt introduced, by the use of paper borders and of hard wood or painted or gilded mouldings. If any of the papers have figures, they should not be obtrusive or in "relief," and if conventionalized treatments of plant forms are used, they had better show an upgrowing tendency, as in nature. If a room is to have no dado, a good combination would be to have the walls a sage green, the wood-work a dull cinnamon-color, the cornice vellum-color with cinnamon and dull violet, and the ceiling a pale gray. It is impossible to give a programme for wall decoration that will suit all cases, but the ruling principle should always be kept in mind that the walls are not for display, but for a background for ever-changing living pictures, or for such works of art as may from time to time be placed against them. The wood-work of a room, if painted, must be in tints that

will harmonize with the colors of carpet and papers, and may be in one or more shades, either lighter or darker, according to the peculiarities of the case. That Yankee abomination, white paint, is going out of use so generally, on both the inside and outside of buildings, that it is perhaps unnecessary to notice it here. Reason is at last teaching us that the snow glare of our Arctic winter furnishes enough of white to keep the oculists profitably employed. J. A. F.

FAMILIAR SCIENCE NOTES.

Glacier Movement. — Apropos of this subject, to which reference is made in the article on the first page of the present number, we see by foreign journals that at a recent meeting of the Swiss Society of Naturalists at Andermatt, M. Hagenbach, a member of the Glacier Committee, gave a report on an investigation recently conducted by M. Gosset, on the Rhone glacier. The measurements obtained, when compared with previous data, afforded ground for some deduction as to the progress and retreat of this glacier. M. Gosset placed four rows of stones at different heights on the glacier, each row being of a distinctive color. Since 1856 it is found that the end of the glacier has retired about 650 metres, and sunk about 95 metres. The rows of stones are, respectively, at 500, 1100, 3500, and 5000 meters from the end of the glacier. At the first two the sinking has been six and five metres in the year, but at the third there is, on the contrary, a rise of two metres, and at the fourth a rise of one metre. This rise of the upper part would appear to be the precursor of a new period of advance of the glacier. The observations made this year will, no doubt, decide.

Measuring Inaccessible Heights and Distances. — A correspondent of the London *Academy* thus describes an ingenious invention of Prof. E. C. Pickering, of our Massachusetts Institute of Technology: "It is designed for measuring the distances and heights of mountains. It consists of a common telescope, with a level attached, a scale of equal parts in the eyepiece, and with a mirror of plate-glass fastened to the object, so that it can be set at any angle. Two images are seen, one through the glass, and the other by reflection from its surface, and any two objects may be made apparently to coincide by turning the mirror through the proper angle. Selecting as our object the mountain whose distance is to be measured, and as the other any convenient, well-defined point, the telescope is moved through a known distance, and the apparent change of position of the two images is measured by the scale. From this the distance may be determined with all the accuracy needed for an ordinary map. The altitude is then determined by levelling the telescope and reading the apparent elevation from the graduated scale, which is now turned round. By a second inclined level, higher mountains may be measured. It will probably equal in accuracy a large theodolite, with the advantage that it does not involve a finely graduated circle or delicate mounting. It is therefore inexpensive, light, and easily used. It could be carried by any traveller, and would give the height of a mountain much more accurately than a barometer. Further, a whole range of mountains might be measured in a few hours by this instrument, while with the barometer a single ascent often occupies several days."

Metallic Reductions in Capillary Spaces. — When a cracked tube containing a concentrated metallic solution of nitrate of copper or chloride of cobalt is placed in a solution of monosulphide of sodium, a diffusion, if the crack is not too narrow, takes place, giving rise to a production of metallic sulphide in the solution of copper or cobalt. This sulphide forms a coating which clings closely to the glass. By degrees there is seen to be formed in the molecular space between the coating of sulphide and the glass, on the side nearest the solution, a brilliant metallic deposit. Similar effects are produced on fixing down on the outside, on the crack, a band of paper covered with a layer of newly-deposited sulphide. Cobalt, copper, platinum, etc., have thus been obtained in a metallic condition. Electro-capillary apparatus formed with split tubes only act if the two liquids which penetrate into the crack by capillary attraction come into contact, which does not happen when the glass is too thick.

HOUSEHOLD HINTS.

A Cheap Window Ventilator. — Professor Kedzie writes as follows to the London *Sanitary Record*: —

"Some one has recommended to place a strip of board three inches wide and as long as the lower window bar, under the lower sash, thus leaving an opening between the top of the lower sash and the bottom of the upper sash, through which fresh air may enter.

"I propose a modification of this plan, by which the air will enter in two thin layers, with an upward movement by which it will mingle with the warm air of the room so as to prevent sensible currents of cold air. Take two pieces of board a quarter of an inch thick, one inch wide, and as long as the lower bar of the window; three narrow pieces half an inch thick and one and a half inches long, one end being cut with the bevel of the window-stool. Nail these pieces across one of the long slats, one at each end and one in the middle, placing the short side of each piece even with the lower edge of the slat. Nail the other slat on the opposite side of these short pieces, bringing the upper edge of the slat even with the square end of the short pieces. This will make a compound bar with half an inch between the slats, and one slat half an inch higher than the other when the whole is turned upon its edge.

"Place the whole under the lower window sash, with the higher slat on the outside. The air can then pass under the outer slat, between the two slats, and enter the room over the top of the inside slat, having an upward motion which will cause it to mingle rapidly with the warm air of the room, and thus prevent any sensible draught. By thus raising the lower sash, a space will be left between the top of the lower sash and the bottom of the upper sash, through which another thin layer of air may enter the room at some distance from the layer at the bottom of the window. This air must also enter with an upward current, causing it to speedily mix with the hot air in the upper portion of the room.

"This arrangement is especially adapted to secure safe window ventilation in bedrooms. If properly constructed and inserted, it will never cause sensible currents in the body of a room except when strong winds prevail, when we usually secure enough ventilation by the imperfect construction of our window-casings, etc."

Washing Silk. — A correspondent of the New York *Evening Post* writes: "I send you directions for cleaning a silk garment. First, rip and dust it. Have a large flat board; over it spread an old sheet. Take ½ a cup of ox gall, ½ cup or (less) of ammonia, and ½ pint of tepid soft water. Sponge the silk with this on both sides, especially the soiled spots. Having finished sponging, roll it on a round stick like a broom handle, being careful not to have any wrinkles. Silk thus washed, and thoroughly dried, needs no ironing and has a lustre like new silk. I treat not only silk but merino, barege, or any woollen goods with the best results."

Practical Chemistry and the Arts.

INTERESTING EXPERIMENTS WITH DYNAMITE.

In an article on Explosive Agents, some months ago, reference was made to certain remarkable peculiarities in the detonation of dynamite, nitroglycerine, and kindred substances as compared with that of gunpowder. Some experiments made a month or more ago in England furnish very striking illustrations of what we said on the subject. The English railway companies have lately refused to transport dynamite, from a fear that it was liable to explode *en route*, and miners and others who use the article for blasting purposes have consequently been put to much expense and inconvenience in obtaining it. The experiments to which we have referred were prepared by the British Dynamite Company in order to prove that there was no danger in carrying dynamite by rail, and the directors of some of the leading railways and other influential gentlemen were invited to witness the tests. The method of packing the dynamite was first shown, much care being taken to prevent the contents of the packages from escaping, and also to preclude the possibility of injury to the material by water. "The cartridges having been rolled in parchment, five pounds' weight of these are inclosed in a cardboard box wrapped in oilskin. Ten packets are next placed in a covering of patent india-rubber felt, perfectly water-proof, the whole being finally inclosed in a stout wooden packing-case."

Then followed the experiments, which were arranged with special reference to deciding the question of the safe transport of dynamite by rail. The following is a concise account of them, which we copy from *Iron*: —

In the first test, a 3 cwt. block of iron, being raised to a height of 24 feet, was allowed to fall on a wooden box containing 50 lbs. of dynamite packed in the manner above described. As the result, the box was smashed, and although several of the cartridges were compressed and burst, no explosion ensued. With a view of showing the intense local action of the explosive, 10 lb. weight was placed at a distance of 9 feet from a temporary wooden fence, and after the explosion it was found that fully one half of the spars had escaped damage, whereas it was contended that had an equal quantity of gunpowder been fired, the paling would have been entirely destroyed. Though dynamite was knocked about during a collision, the manager expressed his belief that it would not explode, and even should this be the case the area of destruction would be extremely small. In order to prove the effective use of dynamite as a fog-signal at sea, experiments of a different kind were made. It could be fired from a spar without the slightest danger either to the spar or to those on deck, — as was shown by two cartridges being placed at the end of a fishing rod, which remained intact, — or the same effect would follow if the cartridge were attached to a small piece of wood and thrown into the water. In another experiment a cartridge was sent to the bottom of a pond, the explosion sending up the spray in a column 40 feet in height. With a view to test the effect of an explosion of gunpowder on a box of dynamite, 25 lbs. of powder were placed in a hollow, closely covered by a large half-inch iron plate, on the top of which was laid a plate containing 10 lbs. of dynamite. After the firing of the charge it was found that the plate had been thrown a distance of 9 feet, and had smashed the box, without any explosion of

the dynamite having taken place. Afterwards a wire rope fully one inch in diameter was nearly severed by half a pound of the explosive, and this was considered an operation difficult of performance. The final experiment consisted of driving a circular tin plate through a half-inch iron plate. To effect this, two lbs. of dynamite were placed in a small wooden roller, open at either end, a tin plate, of the exact circumference of the opening, being placed at one end, and the iron plate at a distance of two feet. By the explosion the tin plate was completely smashed, but it had perforated the iron plate, leaving a series of neat circular openings. It was explained that the roller being open at either end the explosive force was diminished by one half, and that by placing a plate at each end the test could be duplicated.

TOY-MAKING.

A LIVELY English writer gives some curious details of this branch of industrial art, which will interest the younger readers of the JOURNAL, if not their elders. The following is an abstract of the article : —

In Paris there are about five thousand workmen employed in the exclusive trade of toy manufacture. The chief essential in this art is the procuring of the substances — the raw material — to be used, for unless these can be obtained for next to nothing, the finished work would have to be sold too dear to allow of its success. The barrels of sham guns, so dear to the warlike male offspring of the modern Gaul, are wrought up out of old sardine boxes. Dolls' boots are made of the coverings of discarded purses, and their dresses and trimmings of the old worn-out stage costumes of actresses, gathered from every theatre, great or small. As for the wheels which support the thousand movable creations in which the infantine heart delights, they would, of course, if constructed even by toy wheelwrights, be an important item of expense in the profession. As it is, they are provided for by appropriating to this purpose the round pieces cut out from wood or metal when holes are bored in it to allow the insertion of some other article. Such are the cruet-stands in use in France, in which each glass bottle is encased in a layer of wood, while in this country probably medicine boxes would afford a more common example of the same thing. For the little pewter instruments used in dolls' houses, such as plates, knives, spoons, bottles, and fire-irons, the toy-makers press into their service the metal belonging to old water pipes and spouts, worn-out roofing, and the filings collected in workshops. But the most striking and horrible revelation remains yet unmade. Whence comes the lead of which those resolute German and English soldiers are made who stand so bravely on their thin ledge of ground to be picked off by peas and marbles? Let not any boys with tender susceptibilities or a tendency to melancholy be made aware of the answer. They are forged out of the metal cut from ancient coffins dug out of the old cemeteries at Nuremburg.

MEMORANDA IN THE ARTS.

ARTIFICIAL INDIA-RUBBER. — A cheap and useful substitute for india-rubber is prepared by mixing a thick solution of glue with tungstate of soda and hydrochloric acid. A compound of tungstic acid and glue is precipitated, which at a temperature of 86° to 104° F. is sufficiently elastic to admit of being drawn out into very thin sheets. On cooling, this mass becomes solid and brittle, but on being heated is again soft and plastic. This new compound can be used for many of the purposes to which rubber is adapted.

STRENGTH IN RAILWAY CARS. — A note on this subject in *Iron* contains an incidental compliment to the American build of cars as compared with the English. The writer says : "A reform would be the strengthening of railway carriages, to enable them not only to stand the jolting they are necessarily subjected to in transit, but also in some measure to protect the limbs of the passengers in the frequent accidents which vary otherwise monotonous journeys. Some of the companies' carriages are built of the thinnest teak, mere match-boxes, and fly to pieces on the slightest shock. The new Pullman cars are very substantially built, and the difference in results to their occupants, as compared with ordinary carriages, is very remarkable. In the accident the other day at Chiltern Green, the mail train, composed of these cars, dashed into a string of goods wagons whilst it was going at the speed kept up for a short time by Flying Childers, namely, fifty miles an hour. The powerful express engine was thrown over completely on its broadside, along with two of the Pullman cars. Yet the occupants of those cars, who were asleep at the time, scarcely felt the shock, and the only damage to the vehicles can be repaired by a glazier. Had they been the ordinary conventional car, there would probably have been a pretty long butcher's bill. It is perhaps too much to ask the companies to replace their bandboxes with carriages stout enough to stand a collision ; but the existing vehicles might be strengthened sufficiently at each end to prevent them from flying into splinters, as they nearly always do in such cases."

A NOVEL FOOT-WARMER. — There seems to be no end to the eccentricities of inventors. It would be difficult to say what they will *not* attempt to do by means of some cunningly devised "Yankee notion." And some of the new contrivances of our cousins over the water are quite as curious in their way. In a recent number of the English *Patent Journal* the particulars are given of a combination of foot-warming apparatus with a boot. The heel of the boot is of metal and hollow, and contains a supply of artificial fuel, the heat from which is made to pass through channels in the inner sole, a portion of which is placed upon a spring, so that the action of the foot in walking acts like a bellows, drawing in the cold air by an aperture in the heel and driving the heated air into the boot. A modification of the apparatus can, we are told, be applied to horse-shoes. With a little further stretch of invention on the part of the inventor, we might expect to see the steam leg and seven-league boot transferred from the region of fiction to that of fact.

CRYSTALLINE SURFACES ON METALS. — At a recent meeting of the Scottish Society of Arts, in Edinburgh, Dr. Stevenson Macadam stated the results of some experiments he had been making in regard to the production of crystalline surfaces on tinned iron and other coated metals. He ascertained that the best method of producing them was by the employment of an acid mixture containing three parts of hydrochloric acid and one part of nitric acid, diluted with an equal bulk of water. It was necessary merely to immerse the tin plates in the mixture for a period not exceeding ten seconds, the plates afterwards to be thoroughly washed with water, the result being the development of a crystalline appearance which was apparently as durable as the ordinary coating of tin. In order to vary the size of the crystals the tin plates had to be slowly cooled when large crystals were required, and quickly cooled, as by immersion in water, when small crystals were desired. With regard to the question of cost, this process was at least 100 times cheaper than by electricity. A thousand square feet of tin plate could be crystallized, so far as the cost of the acids was concerned, for 7 d. (14 cents.)

In the course of a discussion which followed, Dr. Ferguson described Dr. Macadam's process as being precisely the same as the deposition of water on a frosted pane. If there was a comparatively weak frost, beautiful large crystals were formed ; if sudden or severe frost, the smaller or frosted appearance was the result.

CHROMATE OF IRON. — If to a solution of neutral chromate of lead be added a solution of chloride of iron sharpened with hydrochloric acid, a dusty precipitate is formed, of a bright orange color. This is chromate of iron, which, dried at 104° F., is found to be composed of 65 to 65.11 per cent. of chromic acid and 34.58 to 34.71 of oxide of iron. It is insoluble in water, easily soluble in hydrochloric, nitric, and sulphuric acids, and decomposes when it is digested in a lye of soda. When strongly heated, it swells and changes to a blackish brown. Chromate of iron may be conveniently used for oil-painting, for, though in vivacity of color it is not equal to chromate of lead, it has the advantage over it of not blackening under the action of hydrosulphuric acid, and being in all circumstances without injurious effect on the health. Lastly, it may be obtained at a much lower price than chromate of lead.

PRACTICAL RECIPES.

GREEN BRONZING. — The repeated applications to copper or brass of alternate washes of dilute acetic acid and exposure to the fumes of ammonia will give a very antique-looking green bronze ; but a quick mode of producing a similar appearance is often desirable. To this end the articles may be immersed in a solution of 1 part perchloride of iron in 2 parts water. The tone assumes darkness with the length of immersion. Or the articles may be boiled in a strong solution of nitrate of copper. Or, lastly, they may be immersed in a solution of 2 oz. nitrate of iron, and 2 oz. hyposulphite of soda in 1 pint water. Washing, drying, and burnishing complete the process.

LIQUID POLISH FOR SILVER-PLATED WARE. — The *Druggists' Circular* recommends the following for this purpose : —

Cyanide of potassium	3 to 4 drachms.
Nitrate of silver	8 to 10 grains.
Water	4 ounces.

Apply with a soft tooth-brush, wash the object thoroughly with water, dry it with a soft linen cloth, and polish it with a chamois skin. Neither whiting nor powder of any kind should be used for cleaning and polishing ; they only waste or scratch the silver. In the case of solid silver, some English precipitated chalk is allowable in the solution.

For preserving the lustre of silver or plated ware, when not needed for actual use for a considerable time, a coating of collodion may be employed to great advantage. The articles are to be heated, and the collodion then carefully applied by means of a brush, so as to cover the surface thoroughly and uniformly. It is used most conveniently when diluted with alcohol, as for photographic purposes.

IMITATION SHELLAC VARNISH. — The following article is used by many furniture manufacturers : —

Gum sandarach	1½ pounds.
Pale rosin	1½ pounds.
Benzine	2 gallons.

Dissolve by a gentle heat. This varnish is cheap, quick-drying, and has always given satisfaction.

TO CLEANSE LABORATORY VESSELS. — *Dingler's Journal* says that flasks which have contained oil or fatty matter may be easily cleansed by a solution of permanganate of potash. Hydrated peroxide of manganese is formed, which, on addition of strong hydrochloric acid, liberates chlorine. This decomposes the organic matter, and allows of washing with water. When the flasks have held resinous solutions it is necessary to wash with a caustic alkaline lye, and afterwards to rinse with alcohol. To remove turpentine, petroleum, photogene, etc., wash with 30 or 40 grammes of sulphuric acid and rinse thoroughly in a stream of water.

Agriculture.

NUTRITIVE VALUE OF CORN.

The prejudice existing against the use of maize as an article of human food, among certain classes of people, is surprising, and this prejudice is based on ignorance. Our corn is seldom found in Irish or English kitchens, although millions of bushels are exported to England every year. The people there are strangers to those New England luxuries, corn bread and puddings, and we suppose it will be a long time before they will know anything of them.

Indian corn is one of the most important and healthful articles of human food that a beneficent Providence has bestowed upon man; and to its high nutritive value is due in a large degree the strength and vigor of the race of men who laid the foundations of this great republic. It was much more largely used fifty or one hundred years ago than now, as fine wheat flour, for some not well-founded reason, has usurped its place in bread-making. In the several forms, however, of hulled corn, popped corn, hominy, samp, corn starch, maizena, etc., vast quantities are consumed by all classes of people.

Meal from Indian corn contains more than four times as much oleaginous matter as wheat flour, more starch, and nearly as much nitrogenous material; consequently in all cold climates it is admirably adapted to sustain the system by furnishing heat-forming compounds. The oil gives warmth, the nitrogenous principle gives muscular strength. The combination of alimentary compounds in Indian corn renders it alone the mixed diet capable of sustaining man under the most extraordinary circumstances. It holds the elementary principles which constitute the basis of organic life. In this particular it is more remarkable than any other vegetable production known to man. There is a large number of dishes of which corn meal forms the basis, which are exceedingly palatable. What, for instance, is more delicious than cold corn pudding cut in slices and fried in sweet butter and lard? Hot corn-cakes, when properly and skilfully made, are almost universally regarded as a luxury, and Boston brown bread is famous everywhere in the country. The reason why corn meal is not more largely used at the present time is that it is quite difficult to obtain it of dealers or grocers in a perfectly pure and sweet state. Millers grind the corn as it comes from the West, mixed with portions of the cob and saturated with dust and dirt, and this is sold for kitchen as well as for stable use. Much of the Western corn is damaged in transportation, and this is ground up with that which is sound. If good, sweet, Northern corn is properly ground in an old-fashioned stone mill, after being winnowed to free it from dust, a meal will result of a rich golden color, and no dish can be prepared from it which will not be palatable and most nutritious. In our family we use the Lakeside-grown corn, selected for domestic use, pass it after it is shelled through a winnowing machine, and have it ground between millstones which have been revolving for probably half a century. In this way we secure meal in its highest perfection, and this is what ought to be accessible to all families.

In trials at the farm to test the comparative value of meal from home-grown corn and that from commercial sources, when fed to cows and other animals, we have learned that the nutritive value of the former is nearly double that of the latter, and this practical result confirms analytical results. The difference between the specimens from the two sources is most surprising. Farmers who are so foolish as to go into the market to purchase corn and meal for their animals should understand the great difference in nutritive value between what they can raise and what they purchase.

WOOD ASHES.

Analysis of wood ashes made by Mr. Austin P. Nichols, from ashes taken from the hearth in our dwelling, gave the following potash results: —

	No. 1.	No. 2.	Mean.
Potash,	12.55	12.64	12.59
Carbonate of potash,	18.38	18.55	18.48

The woods from which the ashes came were grown at Lakeside Farm, and consisted of a mixture of hickory, oak, and beech. The results show the amounts of *pure* potash and carbonate of potash which the ashes contained, but the absolute alkali power and value as represented are best shown in the amount of crude or commercial potashes held in the ashes. One hundred pounds held 19.85 lbs. of alkaline salts soluble in water, and consequently, if we estimate the value of commercial potash at 8 cents per lb. we have a cash potash value in these ashes of $1.60 in each 100 lbs. A bushel of dry ashes weighs about 34 lbs.; this would give a potash value to each bushel of about 53 cents. The ordinary ashes, such as are collected in the country by soap-boilers, are usually not so rich in alkaline constituents. The mean potash value of these ashes, estimating upon the basis here adopted, we have found to be about 42 cents per bushel.

From these results it is clear that the farmer had better retain his ashes for farm use than to sell them at the price usually obtained from soap peddlers. Beside the potash salts, ashes contain important amounts of phosphoric acid, soluble silica, etc., which add greatly to their value as fertilizing material. It is safe to say that every bushel of true wood ashes which a farmer produces upon his hearth, is worth to him, for farm use, 40 *cents in gold*. It is therefore very poor husbandry to sell them for 20 cents the bushel, as many do. We value ashes so highly that all offers for them are rejected, no matter what they may be.

In the mixture of raw bone meal and ashes, recommended by us ten years ago, we get quite all the valuable constituents of plant food, and at cheaper rates than in any other mixtures. We have used this combination for many successive seasons, with most satisfactory results. We confidently expect that the German potash products will before long stop the consumption of wood ashes in the manufacture of American potashes, and this will be a happy day for our agricultural industry, if the products of our wood fires are turned in the direction of the farm.

SETTING MILK.

In the Journal for March we gave the report of a committee appointed by a farmers' club in Pennsylvania to make a comparative trial of setting milk in deep and in shallow pans. The result, it will be remembered, was in favor of the latter method. The editor of *Home and School*, Louisville, Ky., has since sent us an account of experiments made by Mr. L. S. Hardin, of that city, who combines deep setting with refrigeration of the milk. After an extended trial of this method, he claims that it has decided advantages over all others. The milk is placed in cans from twelve to twenty inches deep and eight in diameter. These are put in a refrigerator-box with a shelf in the top, upon which ice is placed, and the temperature is reduced below 50°. The milk is skimmed whenever convenient after thirty-six hours. The cream is churned at 58° in warm weather, and 63° in cold weather. The butter is said to be of superior flavor and aroma, fine-grained, uniform in quality, and keeping well. A greater weight is obtained from a given quantity of milk, with less labor and at less cost than by other methods. Mr. Hardin makes two thousand pounds of butter yearly, and sells it at fifty cents a pound throughout the year, which is the highest price in that market. In Sweden butter is made by setting milk in ice-water at a temperature of 40°. In London this butter sold, in 1874, at one hundred and seventy shillings per hundred-weight, while the best American brought in the same market only one hundred and ten shillings.

It may be a question how much of the advantage of this process is due to the deep cans and how much to the effect of cold. According to the London *Lancet*, the effects of a low temperature on milk have been carefully examined by M. Tisseraud, who recently communicated his observations to the Académie des Sciences. He says that, if cows' milk is immediately, or soon after being drawn, placed in vessels at various temperatures between the freezing-point and 90° F., and the initial temperature is maintained for twenty-four or thirty-six hours, it will be found that the nearer the temperature of the milk is to the freezing-point the more rapid is the collection of cream, and the larger is the quantity. The amount of butter is also greater, and the skimmed milk, the butter, and the cheese are of better quality. These facts, he believes, may be explained by Pasteur's observations on ferments and their effect on the media in which they live. It is probable that the refrigeration arrests the evolution of the living organisms which set up fermentation, and hinders the changes which are due to their growth.

AGRICULTURAL REPORT.

The Twenty-Third Annual Report of the Secretary of the Massachusetts Board of Agriculture, for 1876, has appeared, and it is a very valuable work. It contains a great amount of important information, useful to every class of readers, but specially valuable to farmers. It gives a full verbatim report of the proceedings at the Haverhill meeting of the board, and numerous essays of great value. Mr. Sargent's paper upon tree-cultivation is specially important; and Dr. Sturtevant's observations upon corn culture, and the results of experiments with artificial fertilizers, cannot fail to be useful. The volume ought to be placed on sale in the book stores in various parts of the country, as its contents are of far more value to farmers everywhere than ordinary agricultural literature.

NOTES AND MEMORANDA.

Boulder Rocks. — On the first page will be found an extract from the address upon Boulder Rocks delivered before the Massachusetts State Board of Agriculture in December. The address has been printed separate from the State Report, in pamphlet form, but such has been the inquiry for copies that the limited edition is nearly exhausted.

In the *Massachusetts Ploughman*, of this city, for March 11th, the address is published entire, and the publishers inform us that they can supply a considerable number of copies from their edition. Those who have written to us for copies which we cannot furnish will please send to the office of the *Ploughman*, inclosing ten cents, and they will receive the paper by mail.

Arranging a Market-Garden. — A market-gardener writes to the *Evening Post* as follows: "Much labor may be saved by arranging the garden in long, narrow beds, running north and south, instead of irregular and dispersed patches. The fruit should be placed in rows so disposed that they as well as other rows can be cultivated readily and easily by horse and hand machines, of which there are several excellent ones. When thus arranged, the garden can be well ploughed and harrowed by one horse, without injury to the fruit or beds of permanent vegetables or herbs. It will be found very convenient to have a broad plat of grass at each end of the garden, upon which the horse may be turned. These should be kept closely shaven with a lawn-mower. Most of the sowing and planting may be done with a hand-drill, which, with arrangements to enable it to be used as a weeder or a cultivator, can be procured for a few dollars. These implements are a great relief to the labor of gardening, and prevent the necessity of much stooping. They are certainly as necessary to the wife and daughters of the homestead, upon whom the gardening mainly falls, as the horse rake or mower to the boys and the father."

Starting Plants Early. — A writer on gardening gives the following hints on starting tender seeds, such as tomatoes, squashes, melons, and the like: "It is desirable in transplanting not to check growth by disturbing the roots. A good way to avoid this is to scrape out turnips, fill them with good soil, and plant with two or three seeds, setting them in a warm, light place, and keeping them moist. When the weather is suitable, place these out in the garden at the proper depth; the turnip will decay, and the plant will thrive unchecked if properly cared for. Do not use potatoes in place of turnips. Another method is to get squares of sod, say six inches wide, from good, mellow soil turn them bottom up, and put in such seeds as squash or melon or sweet corn, and treat them in the same way, not putting out till the weather is quite warm, and then protecting against bugs. For more delicate plants, flowers, etc., make little square paper boxes out of thin writing-paper or thick newspaper, merely folding them at the corners as you would the paper in covering a book, and tacking them with a needle and thread; make them about three inches square and two deep. Fill with good soil, start the seeds and put out at the proper time boxes and all, without disturbing the roots. If you fear that the paper is too strong for the roots to penetrate, cut carefully on the bottom of the box the shape of a cross, and all will be well."

Horses and Fires. — A writer in the London *Daily News* says: "It is not, unfortunately, generally known that in the case of fire in buildings containing horses, if the harness be merely put on (however roughly) the horses will quit their stables without difficulty. A knowledge of this fact may be the means of saving many a valuable animal from a horrible death."

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Jas. R. Nichols, M. D., *Editor.*
Wm. J. Rolfe, A. M., *Associate Editor.*

BOSTON, MAY 1, 1876.

A NEW MOTIVE POWER.

The mechanical action of the radiation of light and heat, although noticed by several observers during the past half-century, has not until recently been made the subject of careful study and experiment. To Dr. William Crookes, of London, the distinguished chemist, belongs the honor of first demonstrating by delicate mechanical contrivances the existence of a power in radiant light which opens up new fields for thought and investigation. This discovery and the experiments of Dr. Crookes have produced an amount of interest in the world of science but little less than that awakened by the splendid researches of Bunsen and Kirchhoff with the spectroscope in 1858. The experiments of Dr. Crookes began three years ago, and the first paper upon the subject was presented to the Royal Society in May, 1873, but it was not until 1875 that the new-found fact, the mechanical effect of radiation in a vacuum, was announced to the world.

The researches of Dr. Crookes are regarded as so new and wonderful that the President of the Mathematical and Physical Section of the British Association last summer stated that "they were among the most interesting in the whole range of physical science." He claims to have proved that there is exerted by the sun's rays a direct mechanical action; that when light bodies are delicately poised in a vacuum, under peculiar adjustments, they are moved or *repelled* by rays of light, natural or artificial. This movement is claimed to be independent of molecular disturbance in air, and wholly due to radiant light. Some of the apparatus invented by Dr. Crookes to establish this view has been quite recently reproduced in this country, and Professor Cooke, of Cambridge, has made a series of experiments with the "radiometer," the results of which are presented in an interesting article published in the *Advertiser*, of this city, April 3d. The radiometer as described by Dr. Crookes has been made in this country, so far as we know, only by Mr. Demuth, of Cambridge, a very skilful glass-blower. After Mr. Demuth succeeded in making the delicate little instrument, and had produced a dozen or two, which have been widely distributed, he was taken sick of pneumonia, and died. If he had lived, undoubtedly he would have succeeded in making instruments much more perfect than any of those now in the hands of experimenters. Mr. Demuth's radiometer consists of a little wheel, which revolves inside of a glass bulb from which the air has been exhausted. When placed in the sunlight, or near a gas-light or candle, the little arms, to which are attached thin disks of mica, having one surface blackened, revolve with great rapidity upon the delicate needle-point forming the axis on which they are poised.

Professor Cooke differs from Dr. Crookes in his interpretation of the cause of the movements produced, and attributes them to molecular action in the attenuated atmosphere within the bulb. In his view it is the action of heat, rather than of light, and in this he is sustained by the views of Professor Dewar, of Scotland, Herr Neesen, of Germany and several other experimenters of note. Professor Cooke's paper, to which allusion has been made, is exceedingly interesting, and we regret that we have not space to copy it entire.

From some perhaps imperfect experiments with the radiometer, we are led to conclude that the movements occur only under the combined action of light and heat. We do not find that dark heat, like that from steam or hot air, produces the repulsions or movements in a vacuum near perfection. Neither does light, when the calorific rays are cut off. Dr. Crookes's apparatus is undoubtedly much more perfect and sensitive than any which has been produced here. If it were possible to obtain an absolute vacuum inside the radiometer bulb, the difference of views among scientific men as regards the cause of the motion could be settled at once. If Professor Cooke's views are correct, the disk would be motionless; if, on the other hand, the motion is due to light-energy alone, the movements would increase in velocity, and the discoverer's views would be sustained. Professor Dewar's vacuum, like that obtained by Dr. Crookes, was nearly perfect, — so perfect as to forbid the passage of the induction spark. After the pump refused to reduce the tension of the gas, the residue was removed, and the vacuum further perfected by the absorbent power of charcoal. But all this care and labor falls short of producing a *perfect* vacuum, and without this the decisive experiment cannot be tried. The results thus far of Dr. Crookes's patient labor, ingenuity, and scientific skill are worthy of the abundant applause he has received. The medal of the Royal Society was bestowed for the discovery, the highest honor which the most learned body in England can confer.

It is a curious circumstance that this honor is conferred upon one who a short time ago presented papers to the Royal Society describing important experiments and discoveries in another class of phenomena, which were refused reception and even examination by the *savants*. Dr. Crookes devoted *three years* of careful study and experiment to the class of phenomena called "spiritual," and he brought to the labor the same indefatigable perseverance, the same skill in devising mechanical appliances, the same scientific learning, the same clear, cool, analytical powers of mind, displayed in his researches upon the mechanical action of light, but his labors were ridiculed and rejected without examination. We have carefully read Dr. Crookes's papers upon the "psychic force," or "spiritualism," or whatever the class of phenomena may be called, which have appeared in the London *Quarterly Journal of Science*, and we unhesitatingly say that in our view they do not rightfully belong to the class of "rejected papers" to which they

have been assigned. They deserve consideration; they offer to men of true science the results of great labor and painstaking in the investigation of a subject which is agitating the world to a degree greater than any other. They present these results in a form in accordance with scientific methods, they clearly point out the extraordinary care used to eliminate all possible sources of error, collusion, fraud, trick, etc., from the experiments conducted under his direction. The phenomena to which Dr. Crookes attests are so extraordinary, and so directly oppose the most firmly rooted articles of scientific belief, that it is perhaps no wonder his researches met with cavils and sneers. But his later experiments and researches, which are received and applauded by the world, are perhaps but little less wonderful and perplexing. The truth is the wisest and greatest men "see through a glass darkly;" nature does not yield up her secrets without a struggle, and those who engage in the struggle to extort those secrets must not expect in all cases an immediate recognition of the importance of the results of their self-sacrificing labors.

THE AMERICAN CENTENNIAL EXPOSITION.

Very soon after this number of the Journal reaches the hands of its readers, the centennial exposition at Philadelphia will be formally opened to the world. It is indeed a grand enterprise, far surpassing in extent and completeness any world's expositions which have hitherto been inaugurated in Europe.

Great efforts are being made to provide for the comfort and safety of the vast multitudes who will throng the exposition grounds and buildings this summer, and there is good reason to believe that all will be well cared for. The large number of foreigners who will visit our shores for the first time will have an opportunity not only to see our industrial products, but to visit our cities, and other points of interest scattered through the country. We trust they will carry back with them a favorable impression of our wealth, strength, and culture.

The display of chemical products at Philadelphia will probably surprise our visiting friends as much as any class of products on exhibition. Boston will be represented in this department by Messrs. Billings, Clapp, & Co. We have visited their laboratory and been permitted to make a brief examination of the beautiful crystals and liquids which they will exhibit, and we do not hesitate to say that it is a magnificent display, and such as will do credit not only to Boston, but to New England and the country. We shall more particularly notice the chemical department of the exposition at a future time.

SPRING WEATHER.

No resident in New England has any right to be surprised at the local weather, for he is familiar with its freaks and caprices. Its regular character is to be irregular, its rule is to be exceptional. If the past season seems extraordinary, perhaps it is only because we have just been through it, and the next may be equally abnormal in its way. It does really appear, however, as if the winter and spring had been out of the common course on both sides of the ocean. It has been a season of great floods in Europe as well as here. The general character of the winter has been unusually mild abroad as well as at home. In Switzerland an English lady, with one of her fellow-countrymen, accomplished the ascent of Mont Blanc on the 31st of January, after having nearly succeeded on two former trials that month. The achievement was so unprecedented that it excited the wildest enthusiasm at Chamouni, and the returning travellers were welcomed with bands of music, roar of cannon, and blaze of fireworks. Their success, as the local journals remark, was due to the exceptional season, "the oldest inhabitant of the valley having never before seen a winter so favorable as the present for this perilous undertaking."

But if the winter was mild, March was bad enough to make up for it. It may be some comfort to those who have endured the discomforts of the month in New England to know that they would have been no better off in London, Paris, Geneva, or Naples. The *Chronicle*, of Geneva, under date of March 28th, gives the following interesting summary of "weather reports" from various parts of Europe: —

The unhappy people who live themselves under a perpetual cloud, but are sure that there is plenty of sunshine just beyond their horizon, have been occupied, here in Geneva, for some tedious months, in cursing this climate, and their own ill-luck that brought them here to winter. For their comfort, and the improvement of their temper, we cull some passages from our private correspondence as it has just come in.

An eminent *littérateur* of London writes, "We all want to see you in London again; all the same, don't come now; for a more horrible pool of slush and chaos of fierce winds and murderous hail and snow you cannot imagine. Truly, Providence has seen fit to afflict our nation as to its climate; and I am almost resolved to emigrate to some sunnier land."

Perhaps you will say that that is the best that could have been expected from England. Let us cross the Channel, and, being quit of the land of fog and drizzle, seek the sunny skies of *la belle France*. Gay Paris is enjoying a cheerful breeze from the north. "It is horribly cold here, and the wind is very disagreeable, but the river has gone down a good deal. I am glad you are where you can keep warm."

A wail from Stuttgart! "The beautiful spring is not yet. The snow that fell last Sunday still lies in the garden of our neighbors. Yesterday we went to call on our friends on the other side of the town, and L—— said she had not suffered more with the cold any time last winter."

From all this there is no safe refuge this side the Alps. Let us, then, get forth to *das Land wo die Citronen blüh'n*, nor stop short of the delicious semi-tropical beach of the Bay of Naples. From lovely Castellamare comes the report: "The bad weather you speak of seems to have been general. Here we have had very high winds, especially at night, heavy showers of hail and rain and violent thunder. On Saturday last we were all excited by an unusual amount of smoke, greatly tinged with red, coming forth from Vesuvius. It was a beautiful sight, and some of the wise thought it was the forerunner of an eruption. On Sunday these symptoms continued, accompanied at intervals by low sounds like very distant artillery; but they have all passed away, and on Monday, after a storm of wind and rain during the night, we woke to find Vesuvius covered nearly to the base with snow — a most unusual thing, especially so late in the year. It was a very beautiful sight, and the white smoke rising up from the white cone had a most remarkable effect."

If there must needs be cold weather, blessed are they who stay and take it in a cold climate, where there are the necessary provisions for meeting it. Italy when it *is* Italy, with the thermometer in a cheerful temper and every prospect pleasing, is the joy of the whole earth. But Italy, and worst of all Naples, when the mercury cuddles down in the bulb of the thermometer to keep from freezing, and the old women cower over the embers in their *caldini*, and the *lazzaroni* go livid and shuddering and squeak and gibber in the public streets, and the traveller stuffs his *Times* or *Chronicle* in the cracks of the doors and windows, and vainly blows at the soggy and expensive sticks in the fireplace (if there is a fireplace), is quite another thing.

A VALUABLE PAPER.

Dr. Edward H. Sholl, of Gainesville, Ala., has published a very excellent monograph upon Sanitary Science, which the State authorities have ordered to be printed for general distribution. It has some valuable suggestions upon ventilation, cleanliness, cooking, bread-making, etc., which our Southern friends will do well to heed. In this age of the world there is no excuse for ignorance upon the matters which relate to health and the prolongation of life. Dr. Sholl, in sending us a copy of his paper, writes as follows: —

"I have to thank you for much of the valuable information my pamphlet contains, and I desire to thank you personally for your valuable labors, the results of which have been often freely used by me for the benefit of others. I think it nothing but right to inform one who has done so much good through the Journal in a practical way, that his labors are appreciated by others, and to wish him many years of usefulness in his important work."

EDITORIAL NOTES.

Analytical Laboratory. — Patrons of the Journal in all parts of the country have frequently expressed the wish that we would undertake analytical work, and personally supervise the chemical examination of articles sent to us. This has been impossible (except to a limited extent), owing to the incessant business labors and duties we are called upon to perform. We are now able to say that Austin P. Nichols, B. S., has our analytical laboratory in charge, and will attend to any orders or commissions sent to us. He is a graduate of the Scientific School of Harvard University, and has had considerable experience in assaying. Communications may be addressed to office of Journal of Chemistry, Boston.

Sad Bereavement. — The sympathies of the many friends of Mr. Charles E. Billings, senior partner of the house of Billings, Clapp, & Co., of this city, have been deeply touched by his recent bereavement. On the night of the 6th of April, his three young children were suddenly and simultaneously attacked with scarlatina in its malignant form, and within a week two of them died, leaving the third and last remaining child in a critical condition, though hopes are entertained of his recovery.

Photographs of Blood Corpuscles. — In the item relating to the photographing of blood corpuscles, in our last number, it should have been stated that *both* of the objectives used, the $\frac{1}{50}$ as well as the $\frac{1}{75}$, were made by Tolles. As stated, we believe no previous successful attempts have been made to photograph blood corpuscles by such high powers. Dr. Cutter claims that he shows

upon his plates morbid blood, and that specific diseases are indicated, as phthisis, syphilis, etc. The work accomplished is certainly most interesting and important, and worthy the attention of medical gentlemen everywhere.

To Correspondents. — We beg to remind correspondents that we cannot answer all their numerous inquiries. Our family of readers is a large one, and so many letters come to us from all sections of the country that we find it possible to reply to but comparatively few of them. No notice whatever can be taken of those who do not sign their names to their communications.

Educational Tour to Europe. — There is not likely to be much travel to Europe this summer, but it will be all the pleasanter for those who are able to go. Messrs. Cook, Son, & Jenkins, the New York branch of the London house of Cook & Son, announce their usual vacation tour for teachers and others. The party is to sail from New York, July 8th, and will travel abroad in three sections: the first, spending 46 days and costing $300, gold; the second, 60 days at a cost of $400; and the third, 74 days for $500. The first will travel in Great Britain, Belgium, and France; the second will add the Rhine and Switzerland; and the third, Italy also. The cost mentioned includes first-class conveyance, hotels, and all necessary expenses. With Cook's tickets and Hurd & Houghton's "Satchel Guide to Europe" (the 1876 edition of which will be ready by May 1st), teachers and others who wish to make a foreign tour at small expense will be fully equipped for *outre mer*.

A "Moral" Carpet Pattern. — An exchange says: "M. Étienne Guiraud, of the Lowell company, has just completed a design for an ingrain, which will be one of the most original carpets at the Centennial. He calls it '*Les sept péchés capitaux*,' 'The seven deadly sins.' It is a very boldly drawn Neo-Grec scroll, the sins being represented by chimerique figures. It is ingenious in the highest degree." No one, we think, will question the originality of M. Guiraud's design, though some may doubt its taste. Perhaps, however, the notion of trampling sin under foot is meant to be moral rather than artistic. Is the carpet going to Washington?

ATOMS.

At the hospital of St. Bartholomew, London, there is consumed during a year about seven hundred gallons of cod-liver oil, eight hundred pounds of castor-oil, and twelve hundred pounds of Epsom salts. — In the Free Museum, at the Guildhall, London, there is a black piece of wood which belonged to one of the piles of old London Bridge, built by Peter of Colechurch; begun A. D. 1178, completed 1209. — The following method of varnishing prints and drawings is said to give them a showy appearance, and prevent their requiring glasses: Wash over the drawing or print with a solution of isinglass, and when dry apply with a very fine soft brush a varnish composed of two parts of spirits of turpentine and one of Canada balsam mixed together. — Magnetic needles, horse-shoe magnets, and all other iron or steel instruments, which are not exposed to rough usage, are best preserved from rust or corrosion by a galvanic coating of nickel, which may be precipitated from a solution of ammonio-sulphate of nickel by the addition of potassic citrate or tartrate. — There are now some fifteen phosphorus factories in the world, one half of which number is in Germany; the total quantity made is something over 250 tons annually, about one half of which is used in the manufacture of matches. — The National Assembly of France has voted 3,200,000 francs ($640,000) for the erection of new buildings for the Paris School of Pharmacy on the grounds of the Luxembourg; the plan embraces laboratories of chemistry and physics, library, museum, amphitheatre, administrative building, and botanical garden, all on an extensive scale. — The *British Trade Journal* gives the following statistics concerning the spices brought into Great Britain: "We receive yearly about 1,000,000 lbs. of cinnamon; about the same weight of cloves, and 500,000 to 700,000 lbs. of nutmegs; of pepper, about 20,000,000 lbs. (three fourths of which is reshipped to the Continent); of pimento or allspice, 20,000 to 30,000 cwt.; of vanilla, 6000 to 7000 lbs.; and of ginger, nearly 34,000 cwt." — That valuable monthly, *The American Chemist*, is *not* discontinued, as has been reported in some of the papers, though it is not published with perfect regularity. — Morell's antiseptic fluid, which is much used in English hospitals for antiseptic purposes, as well as for embalming, is prepared after the following manner: Dissolve 13.5 parts arsenious acid and 6.9 parts sodic hydrate in 15 to 20 parts water, then add carbolic acid until the clear fluid, after stirring, appears turbid (that is, until the liquid is fully saturated with carbolic acid), and dilute with water to make 100 parts. — An exchange remarks that the quotation of proper names by French journals is proverbially inaccurate, but the obtuseness which converts the name of Professor John Hughes Bennett into that of M. le professeur Huebbenet is beyond comprehension. — Bloch reports that a piece of meat, through which a constant current was allowed to flow, remained unchanged in color and smell after six days' exposure to atmospheric influences; while another piece similarly exposed, but without the electrical current, had become putrid at the end of the six days. — Mr. J. J. Mechi, the eminent English agriculturist, in a letter to Mr. Cobden, which has recently been published, says: "You are quite right in saying that an abundance of food, 'a good dinner,' is the basis of our energies, mental and physical; I have sometimes been so vulgar as to say that 'a full belly and a whole pair of breeches must be the beginning of all morality and religion!'" — Dufour found a notable diminution in tenacity in a copper wire through which a feeble current had passed for several days; in an iron wire the tenacity increased under similar circumstances. — M. Victor de Bonald, a French author, has just written a book on "Moses and Modern Geology," in which he condemns the teaching of geology in Christian schools, and ridicules the Copernican system in a style which the following reference to the motion of the earth will illustrate: "Thus the angels in heaven contemplate in the midst of the works of the creation that which is the masterpiece and the king; not in the grave and majestic attitude of a prince in the middle of his subjects, but turning head over heels and pirouetting about in space in presence of the sun and immovable stars." — *Lippincott's Magazine*, which is always one of the most readable of the monthlies, is giving this year an admirably illustrated series of articles on the Centennial Exhibition and related topics. — The *Commercial Bulletin* says that the crowbar was invented by Priam. — *The Hub*, published in New York, which has become indispensable to the carriage-makers of the country, will make its new volume a "Centennial" one, illustrating fully the contributions of the craft to the Philadelphia Exhibition. — A recent number of the London *Times* recorded the death of nine persons, five males and four females, whose united ages amounted to 773 years, or an average of nearly 86 years each; the youngest being 84, the oldest 93. — *Harper's Magazine* for May contains among its half-dozen illustrated articles Professor Lockwood's third paper on "The Microscope," and the first of a series on "Modern Dwellings: their Construction, Decoration, and Furniture." — Oxygen is now made in France by Tessié du Motay's process, at the low price of 15 to 30 centimes (3 to 6 cents) per cubic metre (about 35 cubic feet).

LITERARY NOTES.

Dr. W. A. Hammond's *Diseases of the Nervous System* (Appletons) is a second edition of a work which for the past five years has been recognized as a standard both in this country and in Europe. The author is perhaps unrivalled as a specialist in this department of pathology. In the new edition he has given us an essentially new book, as it has been entirely rewritten and enlarged to nearly twice its former size. The additional matter is of great importance, for there is no branch of medical science in which the advance of knowledge in recent years has been more rapid. The work is consequently indispensable to the physician who would keep up with the progress of research and discovery in this direction. Some of the diseases of which it treats are discussed here for the first time in English, and much of the matter has hitherto been accessible only in works in a foreign language.

Dr. B. W. Richardson's *Diseases of Modern Life* (Appletons) deals with the train of new diseases that follow in the track of our modern civilization, which, if fruitful in benefit to the race, is productive of incidental evils also. The disorders considered are chiefly those that result from overwork, from alcohol, and from tobacco. In former numbers of the Journal we have given abstracts of Dr. Richardson's able lectures on alcohol, and we shall hereafter refer to his investigations into the effects of tobacco. In the present work he also discusses diseases resulting from food, occupation, late hours and broken sleep, errors in dress, and many others that grow out of the habits and fashions of our way of living in this nineteenth century. It is a very interesting and suggestive book.

The latest issues in the "International Scientific Series" (Appletons) are *The Nature of Light*, by Professor Lommel, of Erlangen, and *Animal Parasites and Messmates*, by Professor Van Beneden, of Louvain. The former is a comprehensive summary of optical science in our day, written with great clearness and well illustrated. The latter is an extremely interesting account of a large and curious class of animals. We have rarely met with a more entertaining book on any branch of natural history.

Recent Advances in Physical Science, by Prof. P. G. Tait (Macmillan & Co.), is made up of a series of lectures on the conservation and transformation of energy, spectrum analysis, the mechanical theory of heat, the structure of matter, and kindred topics. It is just the book for those who wish to get a clear idea of the results of recent physical research without reading larger and more elaborate works.

Floral Decorations for the Dwelling, by Annie Hassard (Macmillan), is a pretty little book on the subject, and this edition has been revised to adapt it to American use. The hints it gives are in excellent taste, and the many illustrations will help much in carrying them out.

Viollet-le-Duc's *Habitations of Man in all Ages* (Osgood & Co.) is one of his most instructive and entertaining works. It describes the origin and development of domestic architecture among the various races of men, and incidentally throws much light on their habits and life from prehistoric times down to the present day. The various forms of building are described so clearly and illustrated so fully that a modern workman could readily reproduce them. We know of no other book that gives so vivid an idea of the varied ways in which man, in different lands and different times, has housed himself. The interest of the subject is increased by the doings and discussions of two imaginary beings, Epergos and Doxius, who watch this human development; the one the personification of the progressive spirit, the other of the tendency to adhere to what is old and traditional. The translation from the French seems very well done.

It is no wonder that the *Life of George Ticknor* (Osgood & Co.) has been one of the most popular books of the season, and that the publishers have found it difficult to supply the demand for it. Some one has called the author "the American Boswell," and Boswell himself does not make us acquainted with a larger number of interesting people or tell us more about them. Think of a man who met and talked with Byron, Campbell, Gifford, West, Dr. Parr, Dr. Rees (editor of the Cyclopædia), Scott, Southey, Wordsworth, Lamb, Hunt, Curran, Sir Humphry Davy, Bunsen Humboldt, Goethe, Niebuhr, Thorwaldsen, Madame de Staël, Châteaubriand, Talleyrand, Lamartine, Guizot, and many others equally noted, and who has the rare faculty of describing them while he keeps himself in the background. This is the great merit of the book, and it will insure it an honorable place in English literature as long as these great names are remembered.

The "Little Classic" Hawthorne is steadily approaching completion, the *Italian Note-Books* and *Septimius Felton* having appeared this month. The former have the peculiar charm of all the Note-Books, and the latter, though unfinished, has a mournful interest as the last work of the author.

All classical scholars will enjoy Morris's *Æneids of Virgil*, reprinted by Roberts Brothers. Though not so literal as Conington's, the quaint old English style makes it delightful reading. We shall not be surprised if it proves the most popular of all the versions of Virgil. Lockwood, Brooks, & Co. have it, with the other books noticed above.

Messrs. Lippincott & Co., publish a *Visitor's Guide to the Centennial Exhibition* (the only one to be sold on the Exhibition grounds) which contains very clear maps of Philadelphia and of the Exhibition premises, with forty-eight compact pages of such information as the stranger most needs. The price is 25 cents in paper covers, 50 cents in cloth. They also issue

Philadelphia and Its Environs, a copiously illustrated description of the city and suburbs, costing only 50 cents.

The same house are the American publishers of a new *Encyclopædia of Chemistry*, devoted especially to its practical applications in the arts and manufactures, a work on the same general plan as the well-known "Muspratt," but brought fully up with the present state of the science. It is to be issued in forty parts at half a dollar each, and may be obtained directly from the publishers or their agents. The six parts already issued show the thoroughness with which the work is to be done, and we can confidently commend it. It is fully illustrated with wood-cuts and also with steel plates, and the mechanical execution is in all respects first-rate. We shall refer to it again.

The Harpers publish a revised edition of *Hooker's Chemistry*, edited by Prof. H. C. Bolton of Columbia College. It is practically a new book, and a very good one for elementary use. Mr. A. C. Stockin, at Lee and Shepard's, Boston, is the New England agent for this and other school-books of the Harpers, including *Rolfe's Shakespeares*, *Goldsmith*, *Gray*, etc.

The April number of the *Official Postal Guide* (Hurd and Houghton) is a bulky one of 394 pages, a liberal half-dollar's worth. The work is indispensable to all who have much to do with the post-office. It is issued quarterly at $1.50 a year.

The Problem of Health: How to Solve It, is a popular book on the subject, by Dr. Reuben Greene, published by B. B. Russell, Boston. It contains much useful information and sound advice, and has already reached a second edition.

The Practical Magazine, published monthly in London, is a handsomely illustrated review of industrial news, inventions, and improvements, almost encyclopædic in its character. It was on our "Clubbing List" some years ago, when the price was ten dollars a year. The terms are now reduced, so that it can be furnished for five dollars to American subscribers. It was not dear at the old rate, and now it is one of the cheapest magazines in the world.

Medicine and Pharmacy.

SALICYLIC ACID IN ACUTE RHEUMATISM.

It would be curious if, with the rapidly increasing applications of salicylic acid, it should prove to be a really valuable remedy for acute rheumatism. Testimony to its usefulness in that troublesome disease has been coming in of late from a variety of sources, domestic as well as foreign. The *London Medical Times and Gazette* gives the following abstract of the results obtained by Stricker in Berlin: —

"For several months all the cases of acute rheumatism in which the local symptoms were strongly marked (fourteen in all) were treated with salicylic acid. The preparation used was one that by repeated crystallization had been rendered almost perfectly pure. Thus prepared it consists of shining white needles, which have no smell, and dissolve completely in water and alcohol so as to form a clear solution. This pure acid can be given internally in considerable doses without any of those unpleasant results which have followed the use of the commercial acid, which probably owes its caustic properties to the presence of other substances — for instance, carbolic acid. The pure acid only excites some dryness in the mucous membrane of the mouth and pharynx, followed by an increased secretion from their surfaces. This inconvenience can, however, be obviated by giving the acid in half-gramme or gramme doses every hour, in the form of powder, and inclosed in a capsule; and in the treatment of rheumatic fever the administration is continued until the joints which were previously affected can be moved without pain. To quote Dr. Stricker's words, 'All the patients thus treated were not only relieved of their fever, but also of the local symptoms — the swelling, redness, and especially the painfulness of their joints — within forty-eight hours; most of them even within a much shorter period.' The largest quantity of pure salicylic acid which was found necessary to produce this effect was fifteen grammes, and the smallest five grammes; but that even larger quantities can be taken internally without injuring the digestive apparatus is proved by the fact that one patient actually took twenty-two grammes in the course of twelve hours through an excess of zeal on his own part; but, nevertheless, his tongue became clean and his appetite returned in the course of this vigorous drugging. As far as Dr. Stricker's observations go, the more acute the case the better the action of the acid. He finds it best to begin the treatment in the morning, for then its effects are generally so decided by the evening that it is unnecessary to disturb the patient's rest to give him his medicine. The general phenomena which were observed to follow large doses of the acid were copious perspiration, ringing in the ears, and slight deafness, and in two cases the patients became more than usually lively. The details of five cases are appended to Dr. Stricker's paper, and the temperature-sheets are given in graphic form in four of them, and we can only say that they confirm in a most striking manner what has been above stated as to the value of the salicylic treatment."

Dr. L. Riess, in the *Berliner klinische Wochenschrift*, also speaks of the results obtained in acute rheumatism as unexpectedly favorable, and points out that the action of the salicylic acid must be more than purely symptomatic, since in some cases a single dose not only permanently reduced the temperature, but also was followed by general improvement in the patient's condition. Dr. Robert Buch, from his own experience in a number of cases, confirms the views of Stricker. He prefers to give the acid, as recommended by Hanow, in solution with phosphate of soda. Dr. Julius Steinitz, of Breslau, gives details of three cases, in which he gave to two adults doses of 7½ grains hourly of the pure acid, and to a child of six and a half years 3 grains at the like intervals. The two former were practically free from pain and fever after nineteen and twenty doses respectively, although the second one had been complicated with very violent delirium. The child required but sixteen doses.

In the *Boston Medical and Surgical Journal* for February 10, 1876, Dr. Charles P. Putnam reports the rapid recovery of a case of polyarthritic rheumatism treated with salicylic acid; and in the same journal for April 6, 1876, Dr. E. L. Warren describes a case which verifies the usefulness of the new remedy. In this instance, severe pain began in the right foot and soon extended to both knees. The pulse was 120; the skin hot and dry; the patient very nervous and fretful. Salicylic acid was given, seven grains in wafers every two or three hours, with no other treatment whatever. After the first few doses marked improvement was noticed, and after the ninth dose (sixty-three grains in all) the patient was decidedly better. The skin was moist, the pulse 80, the inflammation gone from the foot and knees, and he remarked that he felt well enough to get up and go to work.

One of our leading physicians has told us personally within a few days that he had found the salicylic acid to "work like a charm" in a severe case of acute rheumatism in which he had just tried it.

In chronic rheumatism the agent seems to be of very doubtful utility, but the testimony to its value in acute rheumatism has thus far been quite unanimous.

MEDICINE AND CHEMISTRY.

The following is an extract from one of Dr. Thudichum's Cantor Lectures recently delivered in London: —

Organic chemistry is the child of medicine, and, however far it may go on its way, with its most important achievements it always returns to its parent. In ancient times medicine was the mother of philosophy. Thus Aristotle was a medical practitioner, a man whom nowadays, and in this country, you would term an apothecary. He compounded and dispensed medicines and philosophy; he practised only, so to speak, as a collateral pursuit. During the whole of the Middle Ages all natural science found its refuges and starting-points amongst medical men. Even after the rise of learning, about the time of what is ordinarily called the Reformation, physicians were the men who cultivated science, collected facts, compared them, and worked out theories of science. Such a man was Stahl, the originator of what you know as the phlogistic chemistry; such a man no doubt Leibnitz would have been, if, whilst secretary to the Society of Alchemists at Nuremberg, he had not been discovered and appropriated for political purposes by that clever Archbishop of Mayence, the Count of Schönborn. Coming to later times we find that the greatest chemists, such as Boerhaave, were also physicians, or in our own days it has been observed that physicians left the subjects of their early studies and became chemists exclusively. Wöhler, for example, did not turn pure chemist until he had completed the study of medicine, and had at the University of Heidelberg taken a prize for a physiological essay.

This will serve to give you a reason for the peculiar fact that the most important applications of chemistry have reference, not only to the improvement of man's estate by the enlargement of manufactures and the improvement of agriculture, but more particularly to the removal of those evils with which mankind is so terribly afflicted, and with which it has to keep up so constant a battle. We do, of course, admit that one of the principal objects of science in its application to the physical wants of human life is the engendering of healthy growth, the augmentation of muscular power, and the maintenance of that power for the longest possible time. Of necessity science will teach the proper mode of using the strength so obtained, for science I hold, with Socrates, is of necessity the highest morality, and the highest morality is, in its turn, the highest usefulness. Hence it follows that the higher the science the greater its usefulness. Or, putting it in another form, science is virtue; virtue is usefulness. Tried by the contraries, we find the proofs very easy. Vice is never useful, either to the individual who commits it, or to anybody else. Ignorance is never useful, notwithstanding the English adage that it may be bliss.

VIRCHOW, THE EMINENT PATHOLOGIST.

A Berlin correspondent of the *Boston Medical and Surgical Journal* gives the following interesting sketch of Virchow: —

"All in all, he is one of the most remarkable medical men I ever knew. His *personnel* is by no means striking. He is below the average German stature, of a dingy complexion, and with an impassioned expression; one fails to detect the depth of his researches in science, or the strong will or the cutting sarcasm which characterize him. An hour in the *Pathologisches Institut* easily demonstrates his accurate study in that part of medical science to which he has devoted the most hours of the best part of his eventful life. His political tenets, at variance with those of the chancellor of the empire, and in sympathy with that large radical party of Germany whose ideal may be seen in every European government of to-day, — call it by whatever name you please, liberalism, radicalism, or conservatism, — have developed an iron will and a bitter sarcasm which make him a species of terror to the government. In other ways he is remarkable. Always late at his lecture, and appearing now but

twice a week, he has time enough, apparently, for the numerous demands made upon him. On the same day he is to be seen, from nine to eleven A. M. in the *Pathologisches Institut*, demonstrating, with a vest array of material, cellular pathology; and from five to seven or eight P. M. in the Chamber of Deputies of Prussia, of which, this week, he was elected vice-president, over the nomination of his predecessor; later, at work in the Royal Geographical Society. Besides these official appointments, he is chief editor of a popular journal of science, contributes occasionally an article to scientific bodies, and gives popular lectures in the winter. I have alluded to his life as an eventful one. It may not be generally known on our side of the water that, in the revolution of 1848, he fought as a common soldier behind the trenches; that he was forced to abandon his professorship here on account of his political doctrines, and that he went to Würzburg, where the book of his life — the Exposition of Cellular Pathology — was written; that the government was obliged to recall him to his department in the university on account of the urgent demand of scientific men, who recognized his worth by the new book; that later, Prince Bismarck challenged him to a duel, whose acceptance he had the courage to refuse; these, and many other events of his life, make Rudolph Virchow one of the most conspicuous men of the day in Germany. I am told that he regrets the comment not long ago made about him, that he was a severe critic as to the merits of other men. Virchow is poor, lives on the second floor, and complains that he cannot live as a gentleman of his standing should."

AN INTERESTING LETTER BY JOHN HUNTER.

There was a sale of old letters at Messrs. Sotheby's, in London, on the 16th of March, and among the rarities offered none excited sharper competition than a letter of John Hunter's, which was at last knocked down to an American purchaser for £7 10 s. The autograph of Harvey, the discoverer of the circulation of the blood, brought at the same sale only £3 10 s, though it is much rarer than Hunter's. The *London Medical Times and Gazette* prints the Hunter letter, which was written to an Indian correspondent only a few months before his sudden death, and strikingly illustrates his interest in natural history. It is *verbatim* as follows: —

Dear Sir, — I was favored with your letter of September 31, informing me of two birds called the Habanah being *ship'd* on board the "*Bulldog*," but unluckly [*sic*] the Birds died on the passage; however, I consider myself as equally obliged to you for thinking of me and taking so much trouble. I was sorry at the loss of your insects after all the trouble of collecting them, but I hope you will be more *successfull* in future. I mentioned your proposal to Sir Joseph Banks of having a *gardiner* sent out. He told me he had had a letter or letters to that same purpose from you, therefore I suggested if it was a scheme he *aproved* of he would settle that with you; therefore I *drop'd* it. There is one thing I wish very much to have settled in Natural History, which is the natural history of Swallows. They breed with us in the summer and leave us in the winter, and it is what becomes of them in our winter. Now, if they are with you in the winter, and if they should breed with you in that season, it would be a proof that they are birds of passage; and upon the same principle you should have many more in the winter than in the summer. As there are four or five different species in this country in the summer, I should like to have specimens of those that are with you in the winter. I remember seeing swallows in Portugal in the winter, but I cannot say what species they were. It would hardly be possible to get *orstrach* eggs just going to hatch, and to crush the shell and put them into proof spirits to preserve them till they come to England. If a Foal *camell* was put into a tub of spirits and sent I should be glad. Is it possible to get a young tame lion, or indeed, any other beast or bird? If *camelions* were sent, it should be in the Spring, as then one could feed them with flies through the summer. Are there any *cookews* with you? We have none in the winter. I want everything respecting the bee tribe, such as wasps, with their nests; also hornets with theirs. They are a very large tribe. I would have sent you a paper I wrote on the anatomy of the bees, which was publish'd in the *Philosophical Transactions*, but upon inquiry, I found it would cost you more than it was worth. I am a subscriber to the African Society, but I have not heard of the cachuna I think; but as I cannot always attend, they may have come without my knowing it. I consider myself as very much obliged to you for your attention to me, and I wish I knew how I could return it, which would give me pleasure. I hope you keep your health well.

I am, dear Sir, your much obliged and humble servant, John Hunter.

January 15, 1793.

CROUP AND DIPHTHERIA.

Dr. J. Solis Cohen, in an article in the *Medical Record*, sums up the differences between croup and diphtheria as follows: —

CROUP.	DIPHTHERIA.
Non-specific in origin.	Specific in origin.
Never contagious.	Often contagious.
Not inoculable.	Inoculable.
Not of adynamic type.	Of adynamic type.
Usually sporadic.	Usually endemic or epidemic.
Rarely attacks adults.	Often attacks adults.
Always accompanied by exudation.	Sometimes unaccompanied by exudation.
Fatal only by physical obstruction to respiration, whether directly or indirectly.	Often fatal without any physical obstruction to respiration whatever.
No depression of heart.	Marked depression of heart.
Pulse often strong and hard.	Pulse never strong and hard, even though quick and full.
Respiration more accelerated in proportion to the pulse; ratio rarely, if ever, less than one to four.	Respiration not accelerated in proportion to the pulse; ratio usually less than one to four.
Albumen rarely in urine.	Albumen often in urine.
Not followed by paralysis.	Often followed by paralysis.
Would bear antiphlogistics.	Would not bear antiphlogistics.
Rarely attacks more than once.	Often attacks more than once.

INSANITY AND LITERATURE.

Sweet are the uses of adversity, says Shakespeare, and there is a silver lining even to the cloud that darkens the clear sunlight of the mind. This is well illustrated in an article in the May *Atlantic* on "The Madness of George III.," from which the following is an extract: —

The influence of insanity is usually sympathetic. It has been said that genius is a disease of the nerves, and one of the compensations that Providence makes for the sufferings that arise from exquisite sensitiveness. Be that as it may with the intellect, insanity seems to refine the affections, to enlarge one's charity, and to endow one with clearer perceptions of the sorrows and anxieties that rob life of its common comforts and privileges. It gives one a responsive nature; it untunes the harp, but it tunes it again. It is a curious fact that the best-read authors during the reign of George III. seem to have derived their enlarged sympathies with mankind from this extraordinary discipline. Old Burton was long dead, but his "Anatomy of Melancholy," which was written to lift the vapors from his own mind, still retained its popularity. The Odes of Collins, which were just rising into appreciation, were written in the lucid intervals of madness. Dr. Johnson, whose voluntary testimonies to the king's private virtues and goodness of heart have been named by Thackeray as one of the props of the throne, was a most unhappy victim of the English malady, and wrote "Rasselas" and "The Vanity of Human Wishes" under a cloud which for a full half-century threatened the destruction of his intellect. Gay and jolly Oliver Goldsmith, pedantic Boswell, and even Garrick had their moods. The poetry of Cowper embodied the most sorrowful of all experiences. Haley wrote with the shadow of insanity upon his hearth-stone, and Beattie with the recollection of his insane wife ever in his mind.

TREATMENT OF BURNS AND SCALDS.

At the Grätz Medical Congress, Dr. Nitzsche, who is surgeon to several factories in Austria, stated that he had noticed that the workmen who met with burns obtain much relief from the application of varnish. This forms a protective covering in the absence of epidermis, and granulation and cicatrization are favored. Dr. Nitzsche thought he could improve upon this, and tried to keep away Pasteur's germs by adding first carbolic acid, and subsequently salicylic acid, to the varnish. He considers that he thus succeeded in many cases in effecting prompt healing. These burns were probably in the third degree, with complete loss of epidermis. Another kind of burn, where the epidermis is preserved, but much serum is secreted underneath, has fixed the attention of Dr. Marin, of Geneva. This physician grounds his treatment upon Dutrochet's law of exosmose, and thinks that the diminution of the serum effused under the epidermis should be obtained without the destruction of the latter. This is effected by the application of thick fruit jellies, say of quince, raspberries, etc. Compresses of lint should be soaked in the jelly, so as to become considerably thickened. The serum transudes into the compress, and when after a day or two it is removed, the epidermis is found shrivelled up, and the parts beneath protected from inflammation and ulceration. Dr. Marin insists upon the rule that when pieces of clothing are adherent to the burned surface, they should not be removed, for fear of dragging the epidermis with them. The compress should be placed on the clothing material, and the exosmosis will eventually go on just as well. Dr. Marin quotes, in a pamphlet on the subject, several cases well calculated to recommend this kind of treatment, concerning which he is very enthusiastic. It is well known that a long time ago jams and syrups were used in France, *empirically*, in cases of burns. Louis XIV. having met with a burn on his hand, his *valet de chambre* plunged it immediately into a jar of jam with much relief.

MEDICAL MEMORANDA.

Photography as an Aid to Diagnosis. — The *Lyon Médicale* remarks that photography oftentimes presents so high a degree of sensibility that it renders certain defects distinctly visible that the eye could not discern. The portrait of a lady taken by photography was observed to be covered with spots, while the original did not present the slightest trace of them. Shortly after, however, they appeared distinctly enough, and the lady died of small-pox. Photography had thus anticipated sight, and had recognized spots of a very pale yellow before the latter did.

Salicylic Acid for Offensive Breath and Expectoration. — Dr. Da Costa, in the *Medical and Surgical Reporter*, prescribes salicylic acid, five grains, dissolved by means of a drachm of glycerine in half an ounce of water, taken three times a day, in cases where the breath or expectoration is offensive. If internal administration does not accomplish the desired result, the acid can be used with the atomizer in a solution of similar strength.

Liquor Chloral Camphoratus. — According to the *Pharmaceutische Zeitung*, this new preparation, which is proposed as a substitute for camphor oil, is obtained by reducing camphor to a fine powder by trituration with absolute alcohol, and then mixing with an equal weight of chloral hydrate. The result of the admixture is a clean, colorless, syrupy liquid, possessing the smell and taste of the ingredients which compose it. It cannot be considered a chemical compound, as the addition of water causes separation of the camphor and chloral. According to the *Centralhalle* a fluid is obtained also if one part of camphor is mixed with two of chloral hydrate, or three of camphor with two of chloral hydrate. It forms a clear mixture with turpentine, chloroform, benzine, etc., but not with solution of ammonia. Rubbed on the skin it produces a burning sensation. It is said to have been employed with success against rheumatism and toothache, and inhalation of the vapor is recommended to the notice of physicians.

A New Antiseptic Dressing. — Boracic acid in fine powder, one part; white wax, one part; paraffine, two parts; almond oil, two parts. The ingredients, after being mixed by melting the wax and paraffine, are stirred in a warm mortar till the mass thickens, and then set aside to cool, after which the fine substance is reduced in a cold mortar, in successive portions, to a uniform soft ointment. This is spread thin on a fine rag, and when the almond oil disappears, as it soon does through the capillary attraction of the porous external dressing, a smooth, firm layer remains, which can be separated from the skin without leaving any greasy substance adhering, and does not at all confine the discharge, which, while freely shed, is perpetually supplied with a sufficient quantity of boracic acid to insure absence of putrefaction, while not preventing cicatrization. Another, and it is thought by Dr. Henry a better, application in cases of this nature is an ointment composed like the one above described, except that instead of one part of boracic acid it contains half the quantity of salicylic acid, which, while possessing very remarkable antiseptic powers, is even less irritating than boracic acid.

Foot Powder. — It is stated that salicylic acid removes the odor of sweat from the feet, without preventing the sweating; its action being to prevent the formation of butyric, valerianic, and other acids of the same family, which injure the feet. M. Paulcke therefore prepares, with salicylic acid, soap, talc, and starch, a powder for the feet which, while rendering them firm, is said to induce an agreeable softness, and to remove all unpleasant smell.

Electricity as a Sedative. — Dr. Poggioli, in the *Tribune Médicale*, advocates the use of electricity as an energetic sedative agent, not only in nervous affections but even in acute inflammations; and, in support of its efficacy in the latter class of cases, relates one of inflammation of the globe of the eye which resisted antiphlogistic and emollient treatment, and yielded quickly to the use of electricity. He also mentions cases in proof of its sedative effects in many other affections, and considers that electricity should be applied as often for its sedative as for its stimulant effects.

The Digestibility of Milk. — Dr. Carter, of London, in a paper on the digestibility of milk, after discussing various methods which have been generally used with a view of promoting its digestibility, points out that their efficiency is essentially due to the dilution of the casein of the milk, thus causing the precipitation, on its introduction into the stomach, in a granular form, of what would otherwise be firm, bulky, and compact. He has found, by experiment, that simple dilution with water is insufficient for this purpose, and that this object is far better attained by admixture of alkaline or starchy waters with the milk. He himself gives a decided practical preference to barley-water for this purpose.

Escroquerie. — The London *Chemist and Druggist* says that a shrewd swindle was practised lately on certain *pharmaciens* at Orleans. A couple of *chevaliers d'industrie* went round the city, calling at the pharmacies, and offering alcohol on peculiarly advantageous terms. Frenchmen have a weakness for a bargain, and the bait took in a fair proportion of instances. The bulk arrived in the evening, and seemed perfectly equal to sample. The sale had been made for cash, and with the gas burning it was hardly safe to empty the vessels completely. The accounts were therefore paid, and the vendors decamped. Next day one of the purchasers went to empty his can, which he found ingeniously divided into two compartments, the lower and larger one containing pure water, the upper one only being filled with alcohol. Prompt information was given, and one of the rogues soon became the guest of M. le Procureur de la République, the other, at latest advices, being still on his travels.

SANITARY AND HYGIENIC NOTES.

The Drainage of Jerusalem. — The Pool of Bethesda is not precisely a "fount of healing" in our day, according to a recently published report by Sir Moses Montefiore on the condition of the Jewish inhabitants of the Holy Land, from which the following is an extract: "I had some conversation on the subject of general drainage in Jerusalem with a gentleman of authority; he told me that all the refuse of the city is now carried into the Pool of Bethesda, which, strange to say, I was informed, is close to the house intended for the barracks, and the soldiers living there appear not to experience the least inconvenience on account of its vicinity. If arrangements could be made to clear that pool entirely, to admit pure water only, and to dig special pools for the purpose of conducting there the city drains, Jerusalem might become free from any threatening epidemic. All the doctors in Jerusalem assured me that the Holy City might be reckoned, on account of the purity of its atmosphere, one of the healthiest of places."

Typhoid in the Milk-Can. — The English medical journals report another case in which a typhoid epidemic has been traced to infected milk. The village of Eagley, situated about two miles and a half from Bolton, has been suffering from an epidemic of typhoid fever, which has laid prostrate more than a hundred of the inhabitants. The medical officer, Mr. Robinson, suspected that all the affected persons received their milk from one farm, and accordingly procured samples and forwarded them to Mr. Sergeant, medical officer of health for Bolton, and to Professor Roscoe, of Owens College, Manchester. The former has expressed an opinion that the impurity of the milk is the sole cause of the epidemic.

Health and Longevity. — A friend of ours used to speak of "that kind of consumption which a man will live longer with than without;" and there was a truth hidden under the jest. Invalids not unfrequently, from the care they take of themselves, live longer than healthy people whose confidence in their health makes them careless of it. Dr. R. Southey, in a lecture reported in the *Lancet*, remarks: "Health and longevity are not synonymous; neither are health and great muscularity. The most muscular men, great prize-fighters, men who could fell an ox with their fists, have been known to be always ailing, and complaining about themselves. The state of perfect training, regarded by those who know little of it as a condition of most perfect health, is rather one of morbid imminence. Longevity, like height, is a race attribute, but it does not signify health. The three oldest people I ever knew, women who reached respectively eighty-nine, ninety-eight, and a hundred, were valetudinarians, and had been so nearly all their lives."

SELECT FORMULÆ.

Stimulating Hair Lotions. — In response to inquiries for preparations of this kind, we would say that the following formulæ for stimulating the scalp are given by Tilbury Fox: —

(1.)	Glycerine	℥ iij.	
	Lime-water liniment	℥ iv.	
	Tincture of cantharides	℥ iij.	M.
(2.)	Distilled vinegar	℥ iiiss.	
	Tincture of cantharides	℥ vi. to ℥ vij.	M.
	Rose water	℥ iiiss.	
(3.)	Strong ammonia liniment	℥ ss.	
	Castor-oil	℥ ss.	
	Purified spirits of turpentine	℥ ss.	
	White precipitate	gr. xv.	M.

Brush into the scalp with a hard nail-brush until irritation is set up.

(4.)	Tincture of cantharides	℥ i.	
	Distilled vinegar	℥ iss.	
	Glycerine	℥ iss.	
	Spirits of rosemary	℥ iss.	
	Rose water	℥ viij.	M.

To be well sponged on the scalp night and morning.

Treatment of Wounds. — Dr. A. C. Mackenzie, in the *American Journal of the Medical Sciences*, states that he treats wounds with much success with warm water and a balsamic compound. The warm water not only hastens the exit of disintegrated material, but conveys to the sufferer that soothing effect which heat alone communicates. The formula which he uses is the following: —

Balsam fir,	
True Venice turpentine,	
Oil of sweet almond	ãã ℥ ij.

Add carbolic acid ℥ ss. previously dissolved in ℥ ij. warm glycerine. M.

Apply with a flat camel's-hair brush, and inject into the interstices of the wound with a glass syringe, having previously cleansed the wound with very warm water and a bulb-syringe.

Warm water is applied *ad libitum*, and the diseased or injured portion enveloped in flannel cloths immersed in water as hot as can be borne comfortably.

Lavender Water. — The London *Chemist and Druggist* says that a distilled product of considerable fame is prepared thus: —

Oil of English lavender	4 ozs.
Alcohol	5 pints.
Rose water	1 pint.

Mix, and distil 5 pints.

An excellent lavender water obtained by simple mixture is produced from the subjoined formula: —

Oils of lavender and bergamot	ãã 3 drms.
Otto of rose and oil of cloves	ãã 6 drops.
Oil of rosemary and essence of musk	ãã ½ drm.
Benzoic acid	½ drm.
Honey	1 oz.
Alcohol	1 pint.
Esprit de roses	2 ozs.

Mix well and keep till old.

Wanted. — A situation, to take charge of an apothecary store, by a graduate in pharmacy, of six years' experience. Country preferred. Address A. B. C., care Boston Journal of Chemistry.

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Familiar Science.

SHOOTING STARS.

BY PROF. C. A. YOUNG, DARTMOUTH COLLEGE.

EVERY one who has at all indulged in star-gazing must have noticed from time to time what are called shooting stars; luminous points which flash out in the darkness, run a rapid course for a few degrees, and disappear silently after a duration of only a second or two. A few of them are as bright as stars of the first magnitude, and sometimes, but rarely, they are brighter yet, rivalling the larger planets, and leaving a train which, after the meteor has disappeared, glows faintly for some time, changes its form, drifts like a cloud, and finally fades away. But by far the greatest number are faint; indeed, some researches of Heis and others make it probable that telescopic meteors, too faint to be seen by the unaided eye, outnumber the visible in some such proportion as telescopic stars outnumber those we see.

It is hardly necessary to say that these shooting stars are not stars at all, and yet occasionally persons are found whose ideas are no clearer on the subject than those of the old sailor who had been set to watch the meteors in the great shower of 1866, and who said to the officer coming to relieve him, "Please, sir, I would like to stay a little longer; I have got my eye on that bright fellow yonder, and he wiggles awful, and I think, sir, he will fall in a minute or two."

They are very small, for the most part, as Newcomb and Harkness have shown, weighing certainly not more than a few grains, and possibly only some thousandths of a grain, mere particles or cloudlets of dust, which are travelling in space under the same laws as those which govern the motions of the planets and comets, and with a velocity as great; varying in different cases from 8 or 10 miles per second to 40. The least velocity named is more than thirty times that of a cannon-ball. When they encounter our atmosphere this velocity is destroyed by the resistance, and according to well-known laws, their energy of motion is converted into heat of intensity sufficient to render them incandescent, and even to dissipate any solid portions in vapor.

The height at which they make their first appearance is usually between 70 and 80 miles; they disappear at an average elevation of about 50 miles, after traversing a path about 42 miles long on the average, and with a velocity varying as stated above, but averaging about 29 miles per second. These facts are determined by combining the observations of two or more persons who station themselves some miles apart with watches set to the same time. They note the position and course among the stars of every meteor they see, with the time of its appearance, and from these data it is easy, on comparing notes, to compute the facts relating to those which can be identified.

It is the amount of light they give which furnishes the evidence as to their minuteness, but it would take too long to show just how the conclusion is arrived at.

Their numbers are very great. It is found that one observer will on the average see from 4 to 6 per hour at any given place, and careful experiment shows that a single person sees about $\frac{1}{8}$ of all that could be seen by a sufficient number of observers so placed as to watch minutely every portion of the sky. About 40 per hour is therefore a fair average for one station, or nearly a thousand each day. If the calculation is carried out for the whole earth, allowing that at each station all are observed which come within a circle 200 miles in diameter, we find the total number that reach the earth daily is about 5 millions; indeed, Professor Newton, who is perhaps the highest authority on this subject, sets the number still higher, at $7\frac{1}{2}$ millions. A curious fact is that the hourly numbers increase from sunset to sunrise by some 50 per cent. The reason is simply that in the evening we are, so to speak, behind the earth as it rushes through space, and see only those which overtake us; in the morning, on the other hand, we are in front, and see all we meet, as well as those we overtake.

But while we are thus encountering these bodies continually, they are sometimes met in far greater than ordinary numbers, in flocks and showers. None, probably, of our readers who saw the wonderful spectacle of November 13, 1833, have forgotten how for hours the sky rained stars "as thick as drops in a thunder-shower," says one observer; "like luminous flakes of snow," says another. The uneducated and superstitious thought the last great day had come. The stars of heaven were falling, and they expected every moment to hear the trumpet sound and see the dead come forth. Probably no other meteoric shower has ever occurred so magnificent, but similar events on a smaller scale are abundantly recorded. On November 27, 1872, some 14,000 were observed at Rome in a single hour.

During these showers the meteors do not move irregularly through the sky, but the paths of all, or nearly all, follow lines which, traced backwards, are found to diverge from a common point, like the ribs of an umbrella. This is easily explained as a mere effect of perspective, and shows that the meteors really constitute a flock moving side by side in paths nearly parallel. It is found that some of these meteor groups are of such vast extent that year after year the earth, coming at each successive revolution to the same point of space, encounters its members, and is days and even weeks in passing through the swarm. This is the case with the so-called Perseids, known by this name because their "radiant," the point from which their paths seem to diverge, is in the constellation of Perseus. About 150 of these meteor groups have been discovered thus far, among which the most prominent, besides the Perseids, are the Leonids (November 12, 13), the Bielids (radiating from Andromeda, November 27), the Lyrids, radiating from the constellation of Lyra on April 20, and the Geminids, December 12–15.

It has been found also that while the meteors of these groups appear in considerable numbers every year at the specified dates, the great showers occur at regular intervals of many years, a fact which was first clearly made out in respect to the November meteors. The great shower of 1833 has been spoken of. An almost similar one was observed in South America in 1799, and others at previous dates, spaced along at intervals of 33 or 66 years; hence it was inferred that one ought to occur in 1866, and the prediction was fulfilled, though the display was only moderately brilliant; another one was seen in 1867. Thus it becomes evident that these meteor groups move in regular orbits around the sun; and in the case of the Leonids this orbit is an immense ellipse extending from the orbit of the Earth to that of Uranus, and requiring 33 years for the circuit. In the case of the Perseids the orbit is much larger, the period being nearly 120 years; while that of the Bielids is less than 7. It must not be inferred, however, that a shower of Bielids will occur once in 7 years; the group is small, and the shower appears only when the earth happens to be at the crossing-point just when the meteors arrive.

The most remarkable discovery of recent times in respect to these bodies remains to be mentioned. It is found that in four well-marked cases the orbits of important meteoric swarms coincide exactly with the orbits of well-known comets; that the swarm of meteors follows in the wake of the comet, and is somehow connected with it. The discovery dates from 1866, when Schiaparelli first proved the connection between the Leonids (No-

vember meteors) and Tempel's comet. Since then the same thing has been shown of the Perseids, Lyrids, and Bielids.

Of course, if meteors are thus perpetually entering the atmosphere, it is natural to ask, What becomes of them? Do they reach the earth? Probably, as impalpable dust. Nordenskiöld, during the recent arctic expedition examined with great care quantities of snow from regions apparently beyond the reach of all human adulteration, and on melting the snow and evaporating the water he always found a residue consisting largely of *iron* and its oxides. This he considers to be of meteoric origin, and it is not improbable, considering how important a constituent iron is found to be in those larger masses, the aerolites, which from time to time fall upon the earth and are collected into our cabinets.

But the discussion of these bodies and their relations to the shooting stars we must reserve for another occasion.

HOUSEHOLD TASTE.

II.

To select and arrange furniture is a harder problem than to select wall-papers and floor coverings. If all could be "made to order," and from special designs, the task would be comparatively simple. But the choice is restricted by the condition of the market, and one must take the best that can be had and hope only to approximate to perfection. The first thing to be considered is use. All will admit this, but how few really consider it and make it the first requirement. Almost every matron has some one old, low-seated chair, that is employed by preference to sew or tend the baby in; she calls it fitly an "easy chair." Every chair in the house should be an easy chair, and be made expressly to give rest and comfort to some one; and every chair or other piece of furniture should be strongly and honestly made, and show at a glance that it is so and how and why it is so.

The fashion of buying "sets" of furniture of just so many pieces to a room, and those perhaps not just what are needed but such as are dictated by the dealer or upholsterer, leads often to great and unnecessary expense. The chairs for a room should be selected as far as possible to accommodate and make comfortable those who will use them most. They need not be of similar shape or size, or upholstered in the same material, or even material of one color, and the wood-work may be walnut, oak, or ash in one and the same room, and still there need be no offence against good taste. Until people are created of one unvarying pattern, it is best to have reasonable variety in their chairs. If a *modiste* were to insist on putting a family of ladies into uniform, it would doubtless result in a loss of patronage, but a uniform pattern of chair is recommended by the house furnisher with impunity. In old times back-bones were made stiffer, and our grandmothers sat bolt upright on seats of slippery leather, and scorned the aid of artificial backs. But the present generation cannot do it, and with their ordinary course of hygienic training it will be many years before they can, and in the mean time their comfort must be provided for. It is unnecessary to make a chair very heavy in order to have it both strong and comfortable. For invalids it is better to have a roomy wooden chair with removable cushions, rather than one of the clumsy and unwholesome combinations of wood, hair, tow, etc., that sometimes occupy half a bedroom, and can scarcely be moved without the aid of a derrick. For head support a movable rest is better than a permanent high back. It is not expected ordinarily that a chair will serve all the purposes of a bed, although some Englishman did remark that "the Yankees use their spines to sit on."

Next to the chair, the sofas and lounges have most to do with daytime comfort, and these are amenable to the same laws as the chairs. Sofas are generally too cumbersome. They are wasteful of material and room, and tempt the tidy housewife to back-breaking strains in moving them. Half a dozen people may be squeezed upon one, and that is about the limit of their possible service; yet they generally are made, or look to be, capable of sustaining about ten tons. One would think the thrifty matron would discard a pattern so suggestive of that sometimes necessary but unwholesome monster, a "patent parlor sofa bed."

The bedsteads at present popular have monumental backs, panelled, scrolled, and carved, till the eye that views them grows as weary as the hand that strives to keep them clean. These high wooden heads have no possible use; they do not even serve to protect the sleeper from the draught, for you cannot turn them away from the wall, as one side is entirely unfinished. Better a "prison pattern" of clean plain iron than this dirt-collecting humbug. A wooden bedstead can, however, be made which shall be clean, comfortable, and sufficiently beautiful, without resorting to a hospital severity of style. But, after all, it is the bed, and not the wooden frame, or even the lace "pillow shams," that wooes us to balmy sleep.

The moulding machine and the jig saw have done for our furniture what the sewing machine has done for dress, — substituted senseless elaboration for elegant simplicity. Discard the vulgar excrescences, commonly known as ornaments, that overload most household goods, and put the money into honest work and comfort. Do in the house what is being done in the nation: purify everything. This may be a pretty hard task where one is afflicted with hundreds of square feet of machine carving, but much can be done towards it. A householder with a limited purse and a knack for carpentry, who is oppressed by rooms full of furniture of nightmare designs, might find some relief by sawing and chiselling off all unreasonable and meaningless ornaments (so called). He could not fail to improve matters; he would gain in healthful exercise and increase the family store of hard-wood kindlings.

The bureau is a useful piece of furniture, and the chest of drawers set in a dark closet is but a poor substitute for it. The modern "dress toilet," with its long glass and drawers on both sides, is a useful, and, in its simplest form, a pleasing piece of furniture. All drawers should open and shut easily, and to do this they should be made of well-seasoned materials, and be balanced on a centre strip or slide of hard wood.

Tables should stand firmly on four or more good straight legs, and not be balanced on one shaky pivot like a teetotum or an inverted bottle. A list of the accidents that have occurred from sitting or standing on the edges of poorly balanced and badly supported tables would be something appalling. In every well-regulated house there are two places (after the dear fireside) about which the memory of the absent wanderer loves to linger: the family centre table in the living room, and the dining table. Around the former should cling all sweet thoughts of happy evenings, and around the latter equally happy memories of joyful gatherings and liberal hospitality. It seems as if these two, at least, might have the merit of a certain permanent fitness and carefully studied choice of form and material. The times furnish us, "ready-made," for these important positions, a sort of toad-stool pattern "light-stand," and a ricketty "extension table." Old time hospitality set extra dishes on a dining table large enough for all ordinary emergencies; or two solid tables were joined together. Modern ditto stretches out a shaky frame and tucks in another "leaf," a proceeding suggestive of eking out for five a dinner already provided for four.

All furniture should be finished all around, so that any part can be turned to view which suits the arrangement or use for the time. This is specially important in America, where families are driven about from house to house, occupying perhaps half a dozen during a generation. These frequent removes are a bad feature of our civilization. There can be no proper home life without a certain amount of permanence.

Furniture should be selected piece by piece as one has the good fortune to find decent specimens. It is better not to hurry, even if the house has to be occupied half-furnished, and the stock completed as circumstances will allow. Don't make things uncomfortable to please the neighbors; your home is not for them. Have everything made for use, and use the best you have. Comfort and luxury do not consist in the accumulation of things which make work for any one, but in making life simple and in having everything fit and good, not elaborate and showy. Put away all shams and lies, and so order your surroundings that, however modest, they shall serve for what they were intended. If they do this fully, they can never be altogether ugly; for every one should have respect for faithful service, and be able to "see how beauty underlies forevermore each form of use." J. A. F.

MOLECULES AND THE MICROSCOPE.

The marvellous achievements of the microscope, and the possibility of improvements in the instrument that should greatly extend its power, have suggested the bold prediction that it might eventually become capable of making the ultimate molecules of matter visible to our eyes; but Mr. Sorby, in a recent address before the Royal Microscopical Society, shows conclusively that these infinitesimal bodies are far beyond the utmost conceivable range of the microscope.

After referring to various estimates of the smallest visible angle that can be appreciated by the eye, Mr. Sorby gives Helmholtz's formula for calculating the visibility of objects when lights of particular wave-lengths are employed. With a theoretically perfect microscope, and a dry lens, the smallest visible object could not be less than $\frac{1}{80000}$ of an inch long in red light, but

if the lower end of the spectrum alone was used a length of $\frac{1}{110000}$ of an inch could be seen.

There have been several calculations of the probable number of molecules in a cube whose edge is a thousandth of an inch. Mr. Sorby accepts one which reckons the number of molecules in that quantity of water as 3,972,000,000,000,000. In such a complex substance as albumen, if taken in the condition of horn, the number of molecules in a cubic $\frac{1}{1000}$ of an inch is reckoned at 71,000,000,000,000. Thus in the length $\frac{1}{80000}$ of an inch, the smallest that we can rely upon seeing, there might be about 2000 molecules of water, or 520 of albumen, and to see them would require from 500 to 2000 times the power we now possess.

It is hardly conceivable that the power of the microscope could be increased to this extent; but even if this were possible, it would avail us nothing without a change in the nature of light itself. Mr. Sorby remarks: —

"Such power would be of no use unless the waves of light were some $\frac{1}{2000}$ part of the length they are, and our eyes and instruments correspondingly perfect. . . . . We are, as matters now stand, about as far from a knowledge (by vision) of the ultimate structure of organic bodies, as we should be of the contents of a newspaper seen with the naked eye at a distance of a third of a mile."

Some authorities have set the limit of visibility of objects under the microscope at from $\frac{1}{150000}$ to $\frac{1}{200000}$ of an inch, and it has been put as low as $\frac{1}{300000}$ of an inch. But even if we accept the smallest of these estimates, and allow a liberal "margin" under that, it is evident from what has just been stated, that the case would still be hopeless. Science may yet show us, or our descendants, more things in heaven and earth than our present philosophy dreams of, but a sight of the molecules of matter, those minute entities that play so important a part in our modern theories of physics and chemistry, can never be vouchsafed to human eye.

SCIENTIFIC BREVITIES.

Fall of a Meteoric Stone in England. — In Professor Young's article on our first page this month, reference is made to the fact that meteoric stones are only shooting stars "of larger growth." We see by English journals just at hand that during the last week in April there was exhibited in Wolverhampton a meteorolite weighing eight pounds. It fell in a meadow near the Wellington and Market Drayton Railway, about a mile north of the Gradgington Station. It is stated that about ten minutes to four, within a seven miles' radius of the Wrekin, the villages were alarmed by an unusual rumbling noise in the atmosphere, followed immediately by an explosion resembling the discharge of heavy artillery. Rain was falling heavily throughout the afternoon, but there was neither lightning nor thunder. About an hour after the report, a Mr. Brooks went into a meadow, which is in the occupation of his step-father, Mr. Bailey, and noticed that a hole had been cut in the ground. He probed it, and found that what was apparently a hard stone had buried itself in the ground to a depth of eighteen inches, passing through four inches of soil and fourteen inches of clay. It rested upon the gravel underneath these. The stone was dug up and removed to Wolverhampton, where it was found to be a mass of meteoric iron. The hole was almost perpendicular, and the meteorolite is assumed to have fallen in a southeasterly direction. Laborers were at work at the time close to the spot where the meteorolite is supposed to have fallen, and were greatly alarmed. It is stated that the meteoric stone when found by Mr. Brooks was quite hot, although nearly an hour had elapsed from the time of the explosion being heard.

Automatic Purification of Running Water. — According to the reports of the water department of Philadelphia, the impurity in the form of sulphuric acid, from the drainage of the coal mines amounts, at Schuylkill Haven, to nearly ten grains in a gallon, an amount destructive to all animal life in the water above Reading. It seems, however, that near the latter place, three creeks, the Ontelaunee, about six miles above, the Tulpehocken, and Wyoming Creek, at Reading, drain magnesian limestone regions, and thus tend to neutralize the effect of the sulphuric acid by forming sulphate of lime and magnesia at Reading, reducing the amount of acid per gallon to 2.65 grains, and below Valley Creek, at Valley Forge, the amount is said to be reduced to 1.5 grains per gallon or about the same as at Fairmount Dam. The analysis of the water at Fairmount in the years 1842, 1854, and 1865, gave respectively .302, 1.417, and 1.508 grains to the gallon, whilst the lime remained about the same; the magnesia also increased steadily from .230 to .835 in the same interval.

Circular Crystals. — An interesting paper was read at the last meeting of the Royal Society of Edinburgh, by Mr. Dallas, on circular crystals. The author remarked that notes on this phenomenon had been seldom communicated. Sir D. Brewster had been able to get such crystals of only microscopic dimensions, but some time ago he (Mr. Dallas) had found that by crystallization by means of gum arabic, circular crystals of much greater size were formed. This took place with certain salts, but not with all that he had tried; among the more successful were sulphate of copper, binacetate of lead, muriate of morphia, and other similar salts.

Liquid Carbonic Acid in Nature. — Mr. W. N. Hartley (England) possesses a specimen of quartz in the inside of which there is a cavity containing a liquid. This latter was observed to disappear at a temperature of about 36° C., but to reappear on cooling. The actual "critical" point was afterwards accurately determined, and found to be between 30.75° and 31° C. As the temperature at which liquid carbonic acid is transformed into gas is, according to Andrews, 30.92° C., the nature of this fluid is established beyond a doubt.

A Frog Barometer. — The *St. Louis Times* gives the following lively description of this meteorological instrument: —

"Out at the Lafayette Park police station they have a weather prophet which eclipses Tice and all the barometers in the neighborhood. It is a frog of the genus *Hyla*, more familiar to the general reader as the tree-toad. Hunt, the superintendent of the park, was mildly abusing his barometer one day for misleading him, when the officer on the beat, an old frontiersman, said he would show him a trick. He took a glass jar and put into it some stones and a couple of inches of water. Then he whittled out a little wooden ladder and put it in the jar. After some lively scrambling a tree-toad was caught, chucked in, and a tin top screwed on. The weather indicator was complete. When it is going to be fair weather that toad roosts on the top round of the ladder, solemnly blinking the hours away. From twelve to fifteen hours before a change to bad weather, 'the general,' as they call him, begins to climb down, and hours before a storm sets in he squats himself on a stone, and, with his head just above the surface of the water, peers aloft at the coming storm. Let the weather be changeable and 'shifting,' as 'Old Prob' says, and the toad goes up and down that ladder like a scared middy. When it is fair and the toad roosts aloft, his skin is of a light grayish green. When the change comes, the skin turns black as the toad goes down the ladder, becoming a jet, shining black by the time he reaches the bottom. The fame of the toad has spread through the Lafayette Park neighborhood."

HOUSEHOLD HINTS.

How to Select Meats. — An English journal gives the following hints on this subject: "Good and wholesome meat should be neither of a pale rosy or pink color, nor of a deep purple. The first denotes the diseased condition, the last proves the animal has died a natural death. Good meat has more of a marble look, in consequence of the branching of the veins which surround the adipose cells. The fat, especially of the inner organs, is always firm and suety, and never moist, while in general the fat from diseased cattle is flabby and watery, and more often resembles jelly or boiled parchment. Wholesome meat will always show itself firm and elastic to the touch, and exhibit no dampness, while bad meat will appear soft and moist, in fact, often more wet, so that the liquid substance runs out of the blood when pressed hard. Good meat has very little smell, while unsound meat has a disagreeable, cadaverous smell, and diffuses a certain medicinal odor. This can be distinctly proved by cutting the meat through with a knife and smelling the blade or pouring warm water over it. Lastly, bad meat has the peculiarity that it shrinks considerably in the boiling; wholesome meat rather swells, and does not lose an ounce in weight."

To Remove Spots from Carpets. — Mix half an ox's gall with one quart of water; wet and rub the spot with this. Then, with a clean scrubbing-brush, warm water, and soap, scrub the spot well, and wet and half wring a clean floor-cloth in clean cold water and rub the soap and gall out of the carpet; rub the spot with a dry, coarse cloth until it is nearly dry, then pin a piece of thin brown paper over the spot, to prevent dust from settling on it while wet, and leave it to become perfectly dry. If the spot occurs near the side or end of the carpet, undo a few tacks and slip under the spot a thickly folded coarse towel to absorb the water which runs through, and prevent the wet carpet from lying in the dust; after washing the spot, remove the folded cloth and slip in its place a piece of brown paper, and leave this till the carpet is perfectly dry.

Care of Looking-Glasses, etc. — A correspondent of the *New England Farmer* says: "Perhaps some readers have wondered why looking-glasses sometimes get so dull and dim that no washing or rubbing will make them clear. That dimness is caused by heat. A looking-glass or mirror, subjected to sunshine several hours every day, or to the hot air from a furnace, register, or stove, or to the heat of a gas-light or kerosene lamp, will soon become ruined. At first some portion of the glass looks dim and misty, then more cloudy, and, finally, spotted or speckled with black; for the heat has caused the coating of quicksilver to expand and loosen its hold upon the back of the glass, till, after a time, particles fall entirely away, and the glass, once beautified by fair reflections, is rendered unsightly and unattractive forever. Oil-paintings are often seriously injured by the same cause. Much of the blame laid upon the careless mixing of the colors — especially those used by modern artists — rightly belongs to those who hang the pictures. Care is taken to place them 'in good light,' still greater pains should be taken to secure them from heat. If, during some portion of the day, the sun shines directly upon these paintings, or heat rises constantly toward them from stove or furnace, the canvas gradually takes on a dull appearance and soon presents an array of cracks that fills us with dismay; if they are not speedily removed to a more

favorable position, portions of the outer coat may peel off, and the ruin is complete."

Floating Island in an Aquarium. — A correspondent of *Science Gossip* gives the following description of a pretty appendage to an aquarium, which might be modified by the introduction of other plants than hyacinths: "It is a floating flower-garden, which has been in operation about a month. I procured a piece of rough 'virgin cork' (such as is used for ferneries and rustic work, also by photographers), about nine inches long by five inches broad, the thicker the more buoyant, floated it to observe its position, then, from the highest ground, bored two holes about an inch or so in diameter, and a little distance apart, over which I placed two hyacinth bulbs; the roots soon reached the water. From the present healthy appearance of the leaves I have every hope of the success of my scheme. The fish appear pleased with the addition, and have availed themselves of the shade offered by the floating garden."

Practical Chemistry and the Arts.

PEROXIDE OF HYDROGEN.

Oxygen and hydrogen, besides the familiar and important compound water, form one other which is known as binoxide or peroxide of hydrogen, or "oxygenated water," its chemical composition being expressed by the formula H_2O_2. It is not found in nature, and until recently it has been little more than a scientific curiosity, as useless for practical purposes as water is useful. "Unstable as water," is an ancient simile, but in another sense this own brother of water is far more unstable. Even at a temperature of 70° F., it begins to part with its oxygen, so that it is difficult to prepare it in hot weather. At 212° F. it decomposes with violence. Mere contact with gold, silver, platinum, and some other metals that have no direct attraction for oxygen, will cause its decomposition, while the metal remains unaltered.

A solution of this curious compound may be obtained by suspending in water powdered peroxide of barium, (prepared by heating baryta in a current of oxygen,) and passing carbonic acid gas into the water. Carbonate of barium is precipitated, and the water becomes charged with peroxide of hydrogen. It may be obtained in a more concentrated state by the action of hydrochloric acid on the peroxide of barium, the water being afterwards removed by evaporation under the air-pump. The process requires great care, on account of the unstable character of the compound, and as amateur experimenters ought not to attempt it, the details need not be given here. The final result is a colorless, syrupy liquid, with an odor, somewhat like that of chlorine, and a metallic taste. Its specific gravity is about 1.45, and it still contains some water.

Of late years the peroxide of hydrogen has been used to some extent in medicine, and it is not improbable that it may come to be employed on a large scale for bleaching purposes. Dr. Hofmann, in his "Report on the Development of the Chemical Arts during the last Ten Years," expresses the opinion that it will attain some importance in the industrial arts. Tessié du Motay and Maréchal mention it as one of the agents which they propose for bleaching tissues, which, after treatment with permanganate of potash, they recommend to be steeped in a solution of peroxide of hydrogen. But it had been much earlier applied as a bleaching agent by Thénard, for restoring old oil-paintings and drawings. White lead in oil paintings, which has become blackened by the gradual influence of sulphuretted hydrogen, is converted into sulphate of lead by dilute solutions of peroxide of hydrogen, and is thus restored to its primitive color. A fine piece by Raffaelle, the white of which had become spotted with black, was completely cleansed by a solution which contained at most five or six times its volume of available oxygen, and the painting did not suffer. A peculiar action of this bleaching agent has lately been made public by A. von Schrötter. During the last few years, bottles labelled "Eau de la Fontaine de Jouvence," ("water of the fountain of youth,") and containing a colorless liquid, have been sold by perfumers in European cities. The liquid produces a peculiar blonde shade of hair, which attracts attention mainly by its unnaturalness. This secret nostrum is merely a solution of peroxide of hydrogen, made by copious dilution, and by addition of a small quantity of acid — apparently nitric. A bottle costing about $4 yields the purchaser 2.5 to 4 grammes of this substance in solution, and effects its purpose slowly, though surely, within four to six days, thus strikingly illustrating the efficiency of peroxide of hydrogen. This, as Hofmann remarks, would not be the first body whose industrial application commenced with trifles and gradually reached an unimagined extension. Nitrate of silver served first the vanity of the world as a hair-dye, long before its application in photography. Phosphorus, iodine, bromine, and many other substances that will occur to the reader, were at first merely chemical curiosities, but have since become of the utmost importance in practical art and industry. Many a "commercial nothing" has been converted by some discovery of the chemist into a marketable article. Waste products that were worse than worthless, because of the cost of getting rid of them — of which coal-tar is a notable instance, — have been transformed under the magic touch of science into sources of beauty and utility. The chemist can adopt the saying of the poet, "I have unlearned contempt," for experience has taught him that the vilest thing he has to deal with in his manipulations may be the next to undergo this sudden mutation "into something rich and strange," — a metamorphosis more wonderful than that of the conversion of the baser metals into gold, which was the dream of the alchemist.

SILVERED MIRRORS.

Up to the year 1840 mirrors were silvered exclusively by means of an amalgam of tin — a process most destructive to the workmen employed. An important step was effected by an English chemist, Drayton, who conceived the idea of coating mirrors with a thin layer of silver, obtained by reducing an ammoniacal solution of nitrate of silver by means of highly oxidizable essential oils. This process was subsequently modified by several chemists, but became really practical only when M. Petitjean substituted tartaric acid for the reducing agents formerly employed. The glass to be silvered is laid upon a horizontal cast-iron table heated to 40°C. The surface is well cleaned, and solutions of silver and of tartaric acid, suitably diluted, are poured upon it. The liquid, in consequence of a well-known effect of capillarity, does not flow over the edges, forming a layer of some mm. in thickness. In twenty minutes the silver begins to be deposited on the glass, and in an hour and a quarter the process is complete. The liquid is poured off, the glass washed with distilled water, dried, and covered with a varnish to preserve the silver from friction. The advantages are evident. Mercury with its sanitary evils is suppressed; there is a gain in point of cost as 4 to 5 grammes of silver, costing about 1 franc (20 cents), suffice for one square metre, which, under the old system, would require 700 grammes of tin, and the same weight of mercury. A few hours suffice to finish a glass on the new system, whilst the old process required twelve days as a minimum. On the other hand, the glasses thus silvered have a more yellow tint; portions of the pellicle of silver sometimes become detached, especially if exposed to the direct action of the sun, and despite the protecting varnish the silver is sometimes blackened by sulphuretted hydrogen. M. Lenoir has happily succeeded in overcoming these defects by a process alike simple and free from objections on sanitary grounds. The glass, silvered as above, is washed, and then sprinkled with a dilute solution of the double cyanide of mercury and potassium. The silver displaces a part of the mercury and enters into solution, whilst the rest of the silver forms an amalgam whiter and much more adhesive to glass than pure silver. The transformation is instantaneous. The amount of mercury fixed does not exceed 5 to 6 per cent. The glass thus prepared is free from the yellowish tint of pure silver. It is also less attacked by sulphur vapors and the rays of the sun, in which last respect it is superior to mirrors silvered by the old process.

RAILWAY NOTES.

Speed of English Railway Trains. — There has been a good deal of discussion of late in English journals with regard to the highest speed attained on the English railways. The *Engineer* says that the following are the most remarkable authentic instances it knows of high speeds: "Brunel, with the Courier class of locomotive, ran 13 miles in 10 minutes, equal to 78 miles an hour. Mr. Patrick Stirling, of the Great Northern, took, two years back, 16 carriages 15 miles in 12 minutes, equal to 75 miles an hour. The Great Britain, Lord of the Isles, and Iron Duke, broad-gauge engines on the Great Western Railway, have each run with four or five carriages from Paddington to Didcot in 47½ minutes, equal to 66 miles an hour, or an extreme running speed of 72 miles an hour; the new Midland coupled express engines running in the usual course have been timed 68, 70, and 72 miles an hour. The ten A. M. express on the Great Northern, from Leeds, we have ourselves timed, and found to be running mile after mile at the rate of a mile in 52 seconds, or at 69.2 miles an hour. The engines used are Mr. Stirling's outside cylinder bogie express engines, the load being 10 carriages."

Accidents on German Railways. — The running rate on German railways is so very slow that accidents ought to be exceedingly rare. The official list of accidents which have occurred during 1875 on the whole of the German system, exclusive of the Bavarian lines, has just been published, and the following are the principal figures: 755 cases of running off the rails and collision with trains in motion; 1376 with trains at rest; 1250 accidents of various kinds, which were followed by interruption of the regular service. These accidents have cost the lives of 509 persons; 1545 persons have been more or less severely injured. It is estimated that one passenger is killed for every 11,402,067 passengers conveyed, and one passenger injured for

every 2,443,300. The proportion of the accidents to the number of trains is one for every 5394 passenger trains, and one for 2290 goods trains.

A Steam Car for Street Railways. — English papers describe a steam "tram-car" lately tried at Leicester, which is noiseless, condenses its exhaust steam, and consumes its smoke. The engine is of the locomotive type, with two inside cylinders, 6 in. by 12 in., and occupies a space of 10 ft. by 6 ft. The steam is condensed by means of a patent condenser. At the trial the engine was found to be capable of yielding 20 horse-power, and of taking a load of 30 tons up a gradient of 1 in 60. While travelling at the rate of six miles an hour the tram-car can be stopped in less than its own length. The car and engine are to be shipped to the Philadelphia Exhibition, where they will be exhibited by the constructors.

MEMORANDA IN THE ARTS.

A Hindoo Sewing Loom. — It is said that a native weaver has invented "a sort of loom by which he can sew coats and pantaloons, and all other dresses whatever," and the process by which this is done is thus described by one who has personally inspected the invention: "At first he cuts the cloth into shapes and puts these into his loom; and they come out well sewed, and the seams are quite unperceivable, unless we touch them by our hands; and they are like thick threads. The cloths are sooner and better sewed than by the sewing machines."

"The Terror to Western Nations." — China has determined to take its place as one of the great naval powers of the world, and has built a man-of-war, which it has christened The Terror to Western Nations. The Western nations have, however, as yet no great cause to be terrified, since the constructors of the Terror are at present exercised in endeavoring to solve the problem of how to start the vessel on her mission. In the first place, there was a difficulty in launching her, the officials declining to allow sufficient grease for the "ways." When she was fairly in the water she was motionless, the engines refusing to work the screw. The Chinese are said to have arrived at the conclusion that the ship is "bedevilled." They intend to wait till the devils have left her, and meanwhile the Western nations may keep their minds easy.

New Mode of Decoration. — The well-known French earthenware manufacturer, M. Émile Collinot, has just discovered a new mode of decoration for private dwellings and public buildings. Instead of applying the decorated faience to the wall, he proposes enamelling the stone itself, by putting up a light scaffolding and using the blow-pipe instead of the oven. The advantages of the scheme are principally cheapness and durability. The experiments tried show that the process is less expensive than separate plates, and the decoration is calculated to last as long as the stone itself. The architect of the Louvre, M. Lefuel, has given his entire approbation to the process, and means to take the first opportunity of applying it under the inventor's supervision.

Stencilling. — The London *Saturday Review* says of the art of stencilling: "We are able to trace this invention back to the Emperor Justinian, and his historian, the Byzantine Procopius. Procopius records that the emperor, unable to write his name, had a thin, smooth piece of board perforated with holes in the form of the letters JUST, which, when laid on his paper, served to direct his pen, his hand being guided by another. This device was either borrowed or independently hit upon by our first card-makers, who used plates of copper or pewter, with slits on them according to the required pattern, for defining the spaces to be colored. This account of the antiquity of stencil works is to be found in the fourteenth volume of the 'Philosophical Transactions.' The date of Procopius is circ. 527 A. D. It is hardly necessary to say that short-hand or stenography was known to Cicero."

Imitation Meerschaum. — Meerschaum shavings or dust are used, when compressed, for making inferior or imitation pipes; 41,000 cwt. of this waste are annually consumed in Vienna in the production of pipes, cigar-holders, etc., and the imitation has been carried to such perfection that connoisseurs sometimes find it difficult to distinguish these articles from similar ones of the genuine substance. Of the meerschaum itself 12,000 cases, each weighing 50 or 60 lbs., and worth $175 a case, are used in Vienna alone. In working up the shavings and dust into material about sixty women are employed in Vienna, in sorting, sifting, washing, and cleaning the refuse, and rubbing it through silken sieves.

Gilding Picture-Frames. — Eastlake says: "Gilding on a picture-frame is not only justifiable by way of ornament, but is much to be recommended as a foil or neutral ground for enhancing the value of color; but it ought to be laid directly on the wood, without any intervening composition; and if any ornament in relief is attempted it should be carved in the solid material. The effect of oak-grain seen through leaf-gold is exceedingly good, and the sense of texture thus produced is infinitely more interesting than the smooth monotony of gilt 'compo.' This, however, is a point which the modern and professional decorator will generally dispute."

Wood versus Cast Iron. — Herr Hirn has lately been conducting a series of experiments on the comparative strength of wood and cast iron in their different applications, and finds that, in a great number of cases, the former has the advantage. The strength of the wood was found to be in direct ratio to its density; and this strength was increased by immersing the pieces of wood in linseed oil heated to between 80° and 100°C. (185° and 212°F.) for two or three days.

The Absorption of Water by Gas. — Dr. Redner calculates that of every cubic metre of gas recorded as having passed through a wet gas-meter, twenty-three litres (or two thirds of one per cent. by volume of the gas so recorded) is aqueous vapor taken up by the passage of the gas through the water.

USEFUL RECIPES.

Instantaneous Bleaching Fluid. — Into 5½ pints of water, heated to 190° or 212° F., are introduced successively: mother-of-pearl, 3½ oz.; indigo, 0.75 grains; cochineal, 0.75 grains; chloride of lime, 150 grains; soda crystals, 150 grains; potash, 150 grains. Boil for half an hour, and the preparation is ready for use. The inventor, M. Boiselier, says: "The mother-of-pearl gives softness, lustre, suppleness, etc., and gives to hemp the feel of cashmere; the indigo gives a slight azure tint, the cochineal adds brightness, the chloride effects the bleaching, the soda washes and brushes, and the potash removes all grease."

Removal of Nitrate of Silver Stains from Woven Tissues. — The London *Chemist and Druggist* says that chloride of copper completely removes, even from colored woven tissues, stains occasioned by nitrate of silver; the tissue is to be afterwards washed with a solution of hyposulphite of soda, and next thoroughly washed with water. From white cotton and linen tissues, nitrate of silver stains are more readily and effectively removed by applying dilute solutions of permanganate of potassa and hydrochloric acid, followed by washing with hyposulphite of soda solution, and rinsing in plenty of fresh water. By these means the use of cyanide of potassium is rendered unnecessary.

Agriculture.

MAGNESIA AS A FERTILIZER.

Levi Bartlett, Esq., writes as follows respecting this subject, to the *Country Gentleman* of May 10th: —

In your issue of February 24th, in a communication from my pen on the use of ashes, page 115, I stated the fact that Dr. Nichols, of Haverhill, Mass., had been very successful in growing wheat, and that one of the fertilizers he used was the sulphate of magnesia (epsom salts). Since the appearance of that article I have been in the receipt of several letters from farmers, in different sections of the country, inquiring as to the amount used per acre, how applied, the cost, etc.

Being unable to answer those questions, I applied to Dr. Nichols for information. He very kindly furnished answers to my questions. From his letter of April 3d I make the following extracts: —

"The sulphate of magnesia of commerce affords about seventeen lbs. of magnesia to the one hundred lbs. of the salt, and about forty lbs. of commercial sulphuric acid. The amount I have applied to the acre is two hundred and fifty lbs., a quantity far too small to meet the requirements of a large wheat crop; but I hold that in placing within easy reach of the growing plants the elements of nutrition which are positively needed, and which are sparsely disseminated in soils, we aid in the vigor of the plant so that its capabilities of foraging for food are greatly increased. The roots of a young, vigorous plant are much stronger and more extended than those of a weak plant, and they push farther for food, and assimilate it more perfectly when obtained. Therefore, if we have a soil which is capable of furnishing a partial supply of any needed agent of plant nutrition, we give to the plant the power of appropriating it by supplying what may be needed in its early stages of growth. It is like placing within easy reach of a young child the proper elements of food, thereby conferring upon it the strength, as it grows older, to seek its own food under difficulties. . . .

"Both of our cereals, wheat and corn, must have magnesia, and in our soils there is but little of it remaining from the natural supply. . . . .

"We have no magnesian limestones, from the decomposition of which the supply usually comes. Sulphate of magnesia is, perhaps, too expensive a source of supply for general employment. But in estimating cost we must not overlook the importance of the acid in association or combination with the magnesia. I regard sulphuric acid in itself a very important fertilizer. Its usefulness, probably, comes from its secondary effects. Very dilute acid applied to soils increases crop results in a very marked manner. As soon as I have carried further some experiments with this acid, I will publish the results. . . . .

"As regards the sources of a supply of magnesia, we must look to the magnesian limestone principally. In the Stassfurt kainit, and some other German salts, we get an abundance of magnesia in connection with the potash. But I cannot advise any one to purchase their products; they are not economical. In New York, Pennsylvania, Vermont, Missouri, and other States, there are extensive magnesian limestone deposits, and where these exist, the magnesian element of the cereals is abundant. . . . .

"In this State we can afford to use the crude sulphate in limited quantity to give our plants a start, which is very important. Its cost is about $2 per 100 pounds."

I have copied Dr. Nichols's letter for the purpose of answering the several letters I have recently received from subscribers of the *Country Gentleman*. Some thirty years ago, from experiments and observation, I became satisfied that the favorable action of

gypsum on certain soils arose principally from its affording sulphur to the growing plants, and particularly to the decomposing action of the acid upon the silicates of potash, lime, and magnesia in the soil, and during this long period I have seen no cause to change my mind. For clover and leguminous plants, available sulphur is as absolutely necessary as is potash, phosphoric acid, lime, and magnesia. Many writers on the action of gypsum attribute its favorable effects to its ability to fix the ammonia that falls in rain-water. How much ammonia would be fixed in the plaster of a teaspoonful to each hill of corn on an acre of land? I have frequently seen an increase of from 33 to 50 per cent. in cornfields with only a teaspoonful of plaster to the hill; was the increase caused by the extra ammonia fixed in the plaster? I opine not.

We farmers have been told, time and again, that all the fertilizers we need to apply to our soils are lime, potash, phosphoric acid, and ammonia or nitrogen, and that our soils will naturally furnish the other inorganic constituents of our farm crops. But Dr. Nichols has had the sagacity to add magnesia to the list, and Professor Goessmann says: "Since we have learned that magnesia and sulphuric acid count among those few substances which are essential for a complete development of plants, it is but reasonable to assume that the presence of magnesia sulphate must add an increased value to a potash fertilizer which contains that compound (namely, sulphate of potash and magnesia) in considerable proportion."

Therefore he recommends the German salt which is composed of potash, magnesia, and sulphuric acid. Professor Ville found out that he might as well leave out phosphate of lime from his complete manure, as to leave out magnesia.

LEVI BARTLETT.

WARNER, N. H.

LIME KILN ASHES.

SEVERAL cargoes of what are alleged to be wood ashes from the lime-kilns of Maine have reached this city the present spring, and been sold to farmers and others for fertilizing purposes. The price has been 25 cents per bushel as delivered at the wharf. We offered to take at this price what a schooner could bring, if upon analysis they proved to be genuine wood ashes, unleached, and of fair quality. The owner agreed to send us a specimen for analysis, but the parcel was not sent. There is good reason to doubt the high value of these ashes; indeed, we think they are really of little value. If as alleged, they are taken from the lime-kilns, they are largely mixed with hydrate or carbonate of lime and sand, and are therefore almost useless for fertilizing purposes. In 1870 we made analysis of some of these ashes which gave the following result:—

Hydrate of Lime	55 parts.
Silica	13 "
Charcoal	7 "
Ashes, mixture of wood and coal	25 "
	100

The actual value of this mixture is not over 5 cents a bushel. It was sold at 25 cents.

It is probable that in some instances these mixtures are entirely fictitious, and not procured at the lime kilns. The sharp coasting men of Maine may busy themselves during the long winter months in making heaps of coal ashes, lime, sand, etc., with a little of wood ashes, and have them ready to load into their schooners in the spring for the "foreign market."

Ashes, or what is claimed to be ashes, should be purchased only upon the results of analysis, as frauds are as liable to occur in this commodity as in superphosphates or other fertilizing material. "Eternal vigilance" is the price farmers have to pay for exemption from trick and fraud in their dealings with those who presume to supply plant nutriment.

CHEMISTRY OF THE FATTENING PROCESS.

A LEAN cow or ox is in a very different condition, chemically considered, from fat animals of the same kind. In the first place, the poor animal consists of about two thirds water, the fat one of only half, that is, in total weight. A fat animal is in a *dry* condition, a poor animal is like some of our bog meadows, very wet. When the fattening process begins, water commences to disappear, and fat or suet takes its place; and the increase in bulk during the process, is largely of adipose matter. It is a curious circumstance that during fattening, the proteids, or nitrogenous compounds, increase only about 7 per cent., and the bone material or inorganic substances only 1¼ per cent.

The cost to a farmer of fattening an ox is much greater at the close of the process than at the commencement, that is, increase in bulk or dry weight at that period is much more costly. If it costs 3 cents a pound for bulk, for the first month after a poor animal is put in the fattening stall, it will cost 5 cents the last month. If then a farmer consults his money interests, he will not carry the increase in fat beyond a certain point, provided he can turn his partially fatted animals to fair advantage. Farmers have perhaps learned this fact from experience and observation, and hence comparatively lean beef abounds in our markets. Whilst this is of advantage to the farmer, it is very disadvantageous to consumers of the beef, for the flesh of a fat animal in every case is much richer in fixed, nourishing material than that of the lean, and it is never good economy to purchase lean beef. It is better to purchase the poorest parts of a fat animal than the best of a lean one. The best piece of a fat ox (the loin) contains from 21 to 28 per cent. more fixed material than the corresponding piece in a lean one, and curiously enough, the worst piece in the lean animal (the neck), is the richest in nourishing material. The flesh of the neck improves very little in fattening, hence, economy considered, it is the best portion to purchase, as its value is in a measure a fixed one.

Horse-flesh is as nutritious, considered as a food, as that of the ox or cow. The relation of nitrogenous to fixed material is rather higher in a horse than in an ox, and the amount of water is less. There is no good reason why horse-flesh should not be used as food. It is prejudice alone which prevents its employment. It is a regular article of sale in the meat markets of Paris at the present time.

"TONING DOWN" MILK.

THE process of "toning down" milk, as now practiced by the London milkmen, is a new feature in milk manipulation. It is a kind of adulteration for which, strangely enough, there is legal justification, and it can be done at any pump in the metropolis, and in the presence of a whole army of "public analysts" and magistrates, and they are powerless to prevent it. It seems that the "milk standard" in England, fixed by law, is too low, and the establishment of this standard, has led to a more general and more scientific style of adulteration than was formerly the case; it is said that little or no milk is sent into the large towns from the country of a higher standard than the limiting composition of the Society of Public Analysts, and as this limit is considerably below the *average* composition of genuine milk, the inference is that the milk supply from the cows is regularly and systematically tested, and toned down with just so much water as will escape condemnation; indeed, it is whispered that milk analyses are regularly made for some of the large dairies, for the express purpose of finding out what amount of "toning down" is just permissible under the Act. Although it is clear that practices such as these were certainly not intended to be legalized, yet there is a certain amount of fairness in the argument that if the milk from a cow which is on the point of ceasing to give milk, or which for any other reason gives milk of quality below the average, though not below the public analysts' standard, is allowed to pass muster, there can be little or no difference occasioned to consumers if instead of allowing the ratio of milk solids and water in the milk to vary through natural causes connected with the health of the animals, etc., it be made to vary artificially. On account, however, of the liability to contamination with sewage matter which any watering of milk will bring about, and of the disastrous consequences which may follow such contamination, it is clear that such practices ought to be discouraged, and if practicable, to be stopped altogether; which result is not likely to be brought about by the use of a fixed standard, invariable for all breeds of cows and at all seasons of the year.

A CHEAP AND USEFUL HARROW.

AN implement called a "scratch" harrow is very useful upon every farm. It is useful in going over sod land to prepare it for re-seeding, and also for finely pulverizing the surface of ploughed fields preparatory to sowing or planting. Having need of an instrument of this nature the present spring, we inquired at the agricultural warehouses regarding them, and found the price to be about thirty dollars. This seemed too much, and we resolved to extemporize one suited to our wants. A couple of dozen of what are called "Norway spikes" were purchased of a hardware dealer, at a cost of thirty cents; with these to serve as "teeth," we constructed a light harrow of the letter V form, out of 2 × 3 chestnut stuff, and the whole was ready for use in three hours. The actual cost, complete, was less than *one dollar*, and we find it fully meets every want. In using it upon uneven ground, it can be improved by placing a couple of hinge joints in the centre of each side of the harrow.

This tool can be used upon grass ground in the autumn to scarify the surface and open seed-beds in the sod, for the reception of grass seed. It saves ploughing, as not only can seed be covered by it, but fertilizers also. This is a method of grass culture largely adopted in England.

It is quite easy for ingenious farmers to construct many useful tools at low cost, and before expending large sums of money for them let the attempt be made to make them at home.

GLEANINGS AT HOME AND ABROAD.

Chemical Manures. — A correspondent of the *Country Gentleman* writes: "As to the lasting effects of chemical manures, I know from my own experience with them that they do benefit succeeding crops, particularly grass and clover, following wheat, to which superphosphate or guano had been applied at the rate of 175 to 200 pounds per acre with the drill, the grass always being better in the drill rows than anywhere else, although crowded, in its first year's growth, by the wheat plants. I can now see, from where I write, a square in the field to which 200 pounds of superphosphate, made from bone-black, were applied five years ago, when the land was sown in wheat. Orchard grass and clover followed the wheat, and have been mown every year since, some years twice. The clover still sticks to this square, while it has disappeaared from the rest of the field, and it and the orchard grass are now green, while the other parts of the field present a brown appearance."

The Value of Timber in the Scotch Highlands. — A recent English journal says: "An illustration of the value of timber on waste lands in the Highlands is afforded by a sale of wood which took place on the estate of the Earl of Cawdor, in Nairnshire, the other day. In 1820, two hills on the Cawdor property, of about 800 acres in extent, and of almost no agricultural value, were planted with fir and other trees, and after successive thinnings, the sale of which realized large sums, the remainder of the wood has just been sold off for the sum of £16,000 ($80,000). The sums realized for the wood on this waste land during the fifty years is stated to be equal per acre to the return for the best arable land in the country."

The Root-Cap of a Plant. — A recent writer remarks: "The idea held by the earlier botanists, that the tips of all roots consisted of spongy masses of tissue, by means of which plants were enabled to soak up their food from the soil, has, with the aid of the microscope, been entirely discarded. The term spongiole, which was given to these theoretical bodies, is a landmark of departed ignorance, and furnishes a striking contrast with the known structure (the root-cap), with which the tip of every growing root is covered. With the leading botanists of to-day a root is considered to be an outgrowth protected by a cap. This definition seems very short, but if anything further is added, there comes with it a number of exceptions. The name which this covering to the root-tip has received is in itself very descriptive, as it is truly a cap, consisting of a number of layers of quite dense cells surrounding the extremity. These root-caps vary in size in different species of plants; sometimes they are so small that only with the high powers of the microscope can they be seen, while on the other ha d they may be readily observed with the naked eye."

"Fancy" Farmers. — The *New York Evening Post* says: "A great deal of fun has been poked at the class of men known as 'fancy' farmers — persons with large fortunes who farm for pleasure. All their mistakes and shortcomings are held up to ridicule by the opposing class, who call themselves 'practical' farmers. We are glad to find the Chicago *Times* saying a good word for the maligned amateurs as follows: 'What we want to develop the agriculture and horticulture of the country to their fullest extent is a large number of fancy farmers, men who work for pleasure rather than for private gain. These are the men who will perform experiments, and give the world the benefit of them. These are the men who will carry on investigations for the sake of investigating. These are the men who will bring in new grains, new fruits, new vegetables, and new varieties of animals. These are the men who will devote their time and money to the improvement of old varieties and the creation of new ones. The country is sadly in need of more fancy farmers.'"

PRACTICAL NOTES.

Alkaline Wash for Fruit-Trees. — A writer who recommends a weak alkaline wash for fruit-trees, to expand the pores and destroy injurious animal life, says: If you use purchased potash, reduce it so you can bear your finger in it half a minute or more without a tingling sensation. If you can obtain good soft soap from the refuse grease and lye of ashes saved up dry, then take it and reduce it (the soap) down, not to suds, but so that it will not be ropy when used by a soft whitewash brush. Use it freely, and it matters not materially just when, but say at any time most convenient until the middle of July; but after that time it is perhaps better to wait till the next year before applying it.

How to get rid of Tree-Stumps. — General Colquitt, of Georgia, in a recent address, gives the following two ways of doing this: —

"To remove stumps from a field, all that is necessary is to have one or more sheet-iron chimneys, some four or five feet high. Set fire to the stump and place the chimney over it, so as to give the requisite draught at the bottom. It will draw like a stove. The stump will soon be consumed. With several such chimneys, of different sizes, the removal of stumps may be accomplished at merely nominal labor and expense.

"In the autumn, bore a hole one to two inches in diameter, according to the girth of the stump, vertically in the centre of the latter, and about eighteen inches deep. Put into it from one to two ounces of saltpetre; fill the hole with water, and plug up close. In the ensuing spring, take out the plug, and pour in about one to two gills of kerosene oil and ignite it. The stump will smoulder away, without blazing, to the very extremity of the roots, leaving nothing but ashes."

A Cheap Refrigerator. — It is thus described in the *Country Gentleman:* "It is about the size of and resembles, on the outside, an ordinary tool chest; within there are pieces of wood fastened on for supports, and a lining of zinc put in, the space between the zinc and the wood being filled with pounded charcoal. This filling must be all around, in the cover as well as in the bottom and sides. In the ends of the box, cleats of zinc are soldered on, and the shelves of perforated zinc, or wire, or of wooden slats, are slipped in. For a rack to put the ice on, take four slats about four inches long, and nail them firmly to a little block of plank, set this block down (like an inverted kitchen table) in a basin, and put it in the middle space in the box, between the rows of shelves. To make a piece of ice do the greatest amount of service, and last the longest possible time, wrap it closely in several thicknesses of flannel and lay it on the rack. A square tank holding a pail or two of water can be made of tin or zinc and fitted close up to the inside, with a pipe leading through the box, near the bottom, and a faucet attached. If this is kept filled with cold spring or well water, and a lump of ice thrown in occasionally, it will be found a desirable convenience in hot weather. After the box is finished it should be painted and set where the cover, when lifted up, can rest back upon a brace or frame, as it is heavy and would easily break from the hinges. A cellar is a good place for the ice box, but it may be kept in the pantry, store-room or wood-shed, as is most convenient."

We may add that, if kept in a cool cellar, a rough wooden chest, without the zinc lining and the charcoal, will make a very tolerable refrigerator, if the ice is well wrapped in flannel, as suggested above.

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Jas. R. Nichols, M. D., *Editor.*
Wm. J. Rolfe, A. M., *Associate Editor.*

BOSTON, JUNE 1, 1876.

THE JOURNAL'S TENTH ANNIVERSARY.

This is a year of interesting and important anniversaries. Beside the national centennial anniversary, there are others which are of special interest to individuals, classes, organizations, communities, and families, which will not be allowed to pass unnoticed. It is ten years the present month since the establishment of the Journal, and therefore the anniversary of the first decade of its existence is reached. This is not a very long period, but it is a tenth part of the years of our national life. It is an interesting anniversary to us, and we doubt not it also is to our large family of patrons, many of whom commenced with us almost at the start, and have continued up to the present time. We have thousands of warm friends whom we have never seen; they know us better than we know them, for they have read our thoughts, and been guided and influenced by our words, for so long a time that they cannot fail to have learned much of our personal characters and experiences. The conductors of a journal which gains an entrance into cultivated families and is cherished as a safe guide and instructor occupy an interesting and responsible position. It is a position of equal importance with that of the preacher or orator, and the influence exerted is as strong and enduring.

We commenced the Journal in 1866 *without a single bona fide subscriber*, and not supposing we should ever have a single thousand. But the result, surprising as it is to others, is much more surprising to ourselves. Upon this, our tenth anniversary year, we have, beyond all question, a larger number of prompt-paying patrons than any other journal of science *in the world.* Not including a popular journal in New York, devoted to the interests of inventors and mechanics, we probably have more readers than *all the other journals* devoted to popular and abstract science *published in the United States.* These statements are not made in any boastful or improper spirit, but simply as matters of fact. It is probable that every number of the Journal is read by at least *one hundred thousand persons*, and in stating this, we must not be understood to say that we have one hundred thousand subscribers. Our journal goes largely into families, into libraries, reading-rooms, colleges, schools, into clubs, reading circles, medical and scientific societies and associations, and is read by thousands who are not direct patrons. It has found its way into every State and Territory of the Union, into foreign countries, and to the islands of the sea. It unquestionably exerts a very wide influence, and sad indeed would be our emotions if we supposed this influence was

the opposite of that which is healthful, elevating, and improving to the mind and heart.

Since the JOURNAL was started, a number of other periodicals of similar aims and character have arisen, continued for a year or two, and then died. The *Journal of Applied Chemistry*, a very worthy publication, struggled hard to maintain an existence, but it succumbed at last. The journals of science that exist have a hard time of it, and the day of departure of many of them, we fear, is not far distant. It is a pity that our able scientific journals are not better sustained. Every cultivated, educated man and woman in the country should aid those who are laboring in a spirit of self-sacrifice to enlarge the boundaries of science. Our scientific journals, like the *American Naturalist*, *American Journal of Science*, *American Chemist*, etc., are doing much for the honor of our common country at home and abroad, and they deserve generous support. Let them have it.

The success of this journal is probably due to several causes. It evidently is so conducted as to meet the wants of a large class of readers. It would seem to have been successful in the difficult task of placing the facts of science in such a form as to be comprehended by the popular mind. It has been the aim of the editors to popularize science without degrading it. We have good reason to believe that the JOURNAL is read with interest by the most learned professors in our colleges, as well as at the firesides of the merchant, farmer, and artisan. To attain this result is certainly reaching an end seldom attained.

The JOURNAL was founded at a time when we were pressed with business cares, and for the first five years we conducted it single-handed and alone. If there was no other inducement but pecuniary gain to lead us to guide its affairs longer, we should upon this its tenth anniversary, bid adieu to our readers, and retire. But there are ties which hold us to it stronger than money or human applause. The personal attachments of friends, the desire to continue to aid in fostering and disseminating among all classes a knowledge of the sublime facts of science, a hope to create in the minds of the youth of our country higher aims and nobler aspirations, — these are some of the incentives which induce us to continue to conduct the JOURNAL as it enters its second decade.

We have now the assistance of some of the most distinguished scientific men in the country, and every department of the JOURNAL will not only be sustained in the future, but, we hope, will grow more useful and interesting as it increases in years. It is certainly a great accomplishment, considering the history and fate of scientific journals generally, to establish one on so firm a basis as this rests upon, and while indulging in the manifestation of a little perhaps pardonable pride and satisfaction on the present anniversary, we do not forget that our success is due to the constancy and kindness and personal aid of our patrons and friends. May they live through many decades, and continue to welcome the visits of the JOURNAL as the months come round.

DANGEROUS WELLS.

THE important matter of the contamination of well-waters by sewage-filth, drainage from cesspools, privies, and stables, is receiving great attention at the present time, both in this country and in England. The evil is much more common than has been generally supposed, and the serious illnesses which occur in many families are directly traceable to the use of contaminated well-water.

Having been employed by the board of health of a neigboring city to make chemical examination of the water of several wells open to families in crowded localities, we found it to be entirely unsuited to domestic use. One of the wells gave the following result: —

Solid matter in imperial gallon	38.78 grains
Organic	11.03
Inorganic	27.75

The water gave a strong reaction for nitrates, showing that it was polluted by animal filth. This well was resorted to by several families for their daily supply of water, and the attention of the board of health was directed to it from the large amount of sickness in the neighborhood. Another well, the waters of which were used by a cautious and wealthy family, was found to be in unsafe condition from its contiguity to a stable and privy. Sickness had occurred in this family which awakened suspicions, and hence the discovery of its filthy state. It should be remembered that impure waters are not detected by appearances, and not often by taste, as the most dangerous waters are clear, and almost or quite tasteless.

WHISKEY AND STRYCHNIA.

THE inquiry is often made by physicians and others if whiskey or other alcoholic liquors are adulterated with, or contain the terrible poison, strychnia. We reply, *No.* In hundreds of chemical examinations of whiskey made by us, we have never found a trace of the poisonous alkaloid, and we do not believe it is ever used by distillers or whiskey manipulators in their compoundings and mixings. A few grains would render a barrel of spirits so intensely *bitter* that it could not be sold as a beverage; therefore there is no object, no interest to subserve in adding it to spirits. It is possible that it has been used to intensify the bitter in some kinds of malt liquors, but we have never found it in this class of beverages, and further, we have never learned from reliable chemists that it has been found. The required bitter can be obtained cheaply from less dangerous sources.

The adulterations in liquors do not generally partake of the nature of the quick poisons; they are of a different kind. The spirits themselves, as they come from the hands of the distillers, are sufficiently poisonous; and if sophistications are made, they are of the nature of attenuations, and occur from cupidity or desire of gain. Fusel-oil and the other grain oils are natural products, and are found in all whiskeys. They are undoubtedly hurtful in their influence, and whiskey-drinkers shorten their days by habitually swallowing these products even in minute quantities.

PROSPECTIVE INTERNATIONAL EXHIBITIONS.

AFTER the unlucky Vienna exhibition had closed, the opinion was expressed in many quarters that it would be the last of the great international "shows," or such as are devoted to a general display of productions of art and industry from all parts of the globe. But our centennial exhibition has since been inaugurated, and impartial judges consider it the grandest enterprise of its kind that the world has ever seen; and now we learn that France aspires to surpass, in 1878, its brilliant and successful exposition of 1867. We have no idea that this will be the end of these magnificent undertakings. It is more probable that the experiment will be repeated, either in Europe or in this country, every few years for a long time to come.

Meanwhile minor exhibitions of an international character, limited to some special department of science or art, may be expected to occur annually in one country or another. The "Maritime Exhibition" in Paris last summer was a representative and successful affair of this class. This year there is to be the "International Exhibition and Congress of Hygiene," at Brussels, to which we made brief reference in the JOURNAL when the plan was first announced. It opens on the 15th of June and continues till the 1st of October, and is devoted to the exhibition of "means and appliances for the protection and saving of life." These are classified under certain heads, some of which are the following: saving of life from fire; prevention of accidents from traffic, on roads, railways, etc.; means of assistance in time of war; public health; sanitary measures and means of saving life, applied to industry; domestic and private hygiene; medicine, surgery, and pharmacy; improvement of the working classes; hygiene as applied to agriculture; and there are from ten to twenty subdivisions in each of these classes. All the countries of Europe contribute to this exhibition, which is likely to prove of great service in the promotion of hygienic and sanitary science.

Next year there will be an International Horticultural Exhibition, at Amsterdam, on a grander scale than those held in former years at Cologne and Florence. Nearly all the horticultural organizations of Europe have promised their coöperation. In Austria the minister of agriculture has called the attention of agriculturists to the exhibition, and other European governments are expected to give it official recognition and to aid in promoting its objects. It is to be hoped that this country may be represented by a good display of its agricultural and horticultural industries. Parties in New England who may be interested in the matter can obtain full information at the Netherlands Consulate, 113 Milk Street, Boston.

A BEAR IN BOSTON.

THERE are no bears within the limits of Boston now, except in State Street, where the *Ursus financialis* still has his den and seeks his prey; but it appears that such wild beasts were known here not more than seventy years ago. An old correspondent of the JOURNAL, living in Lynn, sends us the following, for the truth of which he vouches: —

In the summer of 1806, or not far from that time, my father who resided in Dorchester, about one mile from what was then the town of Boston, went out alone and on foot in search of a horse that had strayed away. Coming to a piece of land covered with the high blackberry, he stopped to pick and eat the luscious berries. Soon he heard a noise among the bushes, and looking in the direction of the sound was amazed to see a large black bear (*Ursus Americanus*) luxuriating on the same fruit

with himself. Bruin at once raised himself in readiness for a spring, his eyes intently fixed on his intended victim. The latter jumped upon a fallen pine by his side, and remembering that valor is often safer than flight, unless one is certain that he can distance his antagonist, seized hold of a large, dry limb, which broke off near the tree, raised it and brought it down with a crash that shattered it in pieces. This performance evidently nonplussed Bruin, and he decided on a change of base. Leaping to a low ledge of rock near by, he faced his opponent, assumed the erect position, and seemed ready for a fight. My father broke off and shattered two or three more limbs in the same way. The bear then began a slow retrograde movement, made by short backward hops, his eye still watching for any hostile demonstration on the part of him he now confessed to be his compeer. This cautious retreat continued till he had gone some thirty or forty rods, when, judging himself to be at a safe distance, he ran at his greatest speed into the neighboring woods, while my father, well pleased with the result of his strategy, made no delay in leaving the blackberry patch where more than one had that day been badly frightened.

EDITORIAL NOTES.

A Compliment to the Journal. — The *New York Evening Post*, whose praise is something to be proud of, says: "The *Boston Journal of Chemistry* for May contains an admirable article on 'Household Taste.' The *Journal* has of late been publishing several instructive and entertaining papers on domestic and architectural topics, which, taken together, would form a valuable library of reference for persons who contemplate building and taking care of a house."

Some Interesting Curiosities. — The Exhibition of Scientific Apparatus opened at South Kensington, London, on the 1st of May, includes some very rare and curious objects. Among these are the original telescopes and other instruments used by Galileo, now for the first time allowed to be removed from Florence. Watt's first steam-engine is also to be seen, as well as the original air-pump made by Otto Guericke, of Magdeburg; a quadrant belonging to Tycho Brahe; a telescope by Huyghens; the pendulum apparatus of Foucault and Gauss; Babbage's calculating machine, and that made by Jas. Black for Lord Mahon; the original Napier Bones; the measuring instruments of Sir Joseph Whitworth; the apparatus employed by Joule in ascertaining the mechanical equivalent of heat; the apparatus with which Faraday made many of his discoveries; the original Wheatstone Bridge; the instruments used in laying the Atlantic Cable; and Armstrong's hydro-electric machine.

Japan sending Bricks to London. — Just now there is danger of a famine of bricks in London, on account of "strikes" among the workmen engaged in the manufacture of the article. After commenting on the disastrous consequences of a dearth of this kind, *Iron* says: "Help, however slight, has nevertheless come, and from an unexpected and distant quarter. For some time past there has been a limited trade in bricks between Japan and America, but in a great degree impeded by high import rates; and one of the young Japanese sent over to this country to be educated at the expense of his government, with a creditable commercial acuteness, suggested that the cargoes refused by the Americans should be brought to England, to which they are admitted duty free. Last week a shipload of Japanese bricks were accordingly placed, as an experiment, on the London market, and not only was the cargo almost instantly bought up, but large orders for future supplies were given by leading contractors and West-End builders. The Japanese bricks are described as considerably harder than those of home production, and they can, of course, be manufactured to any pattern, either plain or ornamental. With these bricks, and woodwork from the Continent, also duty free, the master builders will be in a somewhat favorable position for making terms with both brickmakers and carpenters, the latter of whom are at present engaged in an agitation which bodes future mischief."

ATOMS.

In the treatment of burns in the Charity Hospital, New York, when of a superficial character, a preparation consisting of two parts of collodion and one of olive oil has been found to be very efficacious. — The *Revue Médicale* says that leeches may be preserved in a state of healthy activity for months by adding to every 100 grammes of water so small a quantity as four drops of a solution of one part of salicylic acid in 300 of water. — An English journal says that rolled iron sheets .0015 of an inch thick have lately been made at Warrington, so flexible that they bend almost as easily as paper, and yet so tough as to be torn with difficulty. — An aerolite weighing about five tons, which was discovered by Professor Nordenskjöld, of Norway, while on a scientific expedition to the arctic regions, is among the curiosities on exhibition at Philadelphia. — Another item in the big "show" is a mammoth ream of paper from Holyoke, Massachusetts, weighing about a ton, the separate sheets measuring six by eighteen feet; the value of the whole being $1500. — Small planet No. 162 was discovered by M. Prosper Henry at Paris on the 21st of April. — The obituary column of a Philadelphia paper lately contained a record of the deaths of seventeen persons (six men and eleven women) who were all eighty or more years of age. — There are 810 newspapers and other periodicals in the Austrian empire. — The relative healthfulness of some of the great cities of the world is shown by the following figures, recently published in *La Gaceta Industrial* (a Madrid paper), which exhibit the annual mortality for each 1000 inhabitants: Madrid, 65.0; Vienna, 32.7; Berlin, 30.6; Rome, 29.3; New York, 27.9; Turin, 24.8; Brussels, 24.8; Paris, 23.2; London, 22.2; Philadelphia, 20.3. — A Paris medical journal says that a resolvent ointment employed at the *Hôtel Dieu* with great success consists of one part of camphor, four parts of chloride of ammonium, and thirty of lard. — The *Lancet*, referring to the fact that Weston's walk at Birmingham, Eng., was marred by the occurrence of vertigo, remarks that it is convinced that such exhibitions of endurance are made at great risk, and are difficult of justification; walking is a natural thing, but walking 150 miles in 38 hours is not according to nature. — The medical profession of Lyons, France, are not in favor of the establishment of small-pox hospitals; which leads a facetious journalist to remark that they deserve to be "pitted." — There is a very interesting article on "Humor in Animals," by Professor Lockwood, in the May *American Naturalist*, the best number yet under the new management, which has been from the first a great improvement on the old. — *Lippincott's Magazine*, which has always taken a high rank among its contemporaries, is surpassing itself this centennial year, especially in its illustrated articles on Philadelphia and the exhibition. — The *National Teachers' Monthly*, published by A. S. Barnes & Co., New York, at only one dollar a year, is as good as it is cheap, and no teacher in the country who subscribes for it will repent the investment.

LITERARY NOTES.

The Appletons have just published *Lectures on Orthopedic Surgery and Diseases of the Joints*, by Professor Lewis A. Sayre, being the full course delivered at Bellevue Hospital Medical School during the winter session. They have been printed in response to the urgent request of many medical gentlemen that Dr. Sayre would prepare a work setting forth his peculiar views of the pathology and treatment of this class of diseases. In addition to the cases discussed in the lectures, others from the author's note-book and the hospital records have been added to elucidate the principles taught. The volume is copiously illustrated with wood-cuts from original drawings and photographs. It is an important contribution to surgical literature by one who is recognized as an authority not only in this country but in Europe.

The latest issue in the "International Scientific Series" is *On Fermentation*, by P. Schützenberger, Director of the Chemical Laboratory at the Sorbonne, Paris. It is a clear and compact summary of the present state of our knowledge on a difficult and much disputed subject, and the translation from the French is so well done that it reads quite like an original English work.

The Appletons also publish a half-dollar *Handbook of American Cities*, which is the best illustrated book of the kind we have seen, and the correction of a few errors in the next edition will make it one of the best in all respects.

Macmillan & Co. have lately brought out *An Elementary Treatise on Diseases of the Skin*, by Dr. H. G. Piffard, Professor of Dermatology in the University of the City of New York. It is intended to furnish the student with a guide to the study of elementary dermatology, and to be an aid to the practitioner in the recognition and treatment of cutaneous diseases. It contains a summary of the standard literature on the subject, supplemented with the results of the author's personal experience. Besides many wood-cuts, it contains five full-page plates of photo-micrographs, which are striking examples of the capabilities of this method of illustration. They surpass in delicacy and finish every form of engraving, and have the additional advantage of being absolutely accurate.

The series of papers on *The Sanitary Drainage of Houses and Towns*, by Col. George E. Waring, Jr., which appeared in the "Atlantic Monthly," have been expanded by the author into a volume, published by Hurd and Houghton. The subject is beginning to attract somewhat the attention it deserves, and this book comes very opportunely. It is thoroughly scientific and at the same time practical and popular, so that unscientific readers can understand and apply its teachings. We hope it may have the widest possible circulation.

From the same house we have the *Riverside Press Centennial Guide-Books*, which include separate Guides to New York, Philadelphia, and Washington, sold at 15 cents each, in paper covers, and *Boston to Washington*, comprising the three, with much other useful information and a large railroad map of the United States. This costs 35 cents in paper, or $1.00 in cloth. These books are really, as the publishers claim, "complete, compact, convenient," and withal the cheapest of their kind.

Harper's School Geography, just out, may safely be called the most elegant school text-book of geography ever issued, and from a casual examination we judge it to be as good as it is handsome. Teachers and school committees who are meditating a change of books in this study should not fail to examine it before making a decision.

Another beautifully printed and illustrated book from the Harpers is the *Select Poems of Thomas Gray*, edited by W. J. Rolfe, to which we briefly alluded in advance of its publication.

The "Little Classics" edition of Hawthorne has been completed by the issue of the three juvenile volumes, *The Wonder-Book*, *Tanglewood Tales*, and *True Stories in History and Biography*, which have long been classics with the young people, and will be widely welcome in this new and attractive form.

Osgood & Co. have also published a "Centennial" edition of *Whittier's Poems*, for one dollar. It includes all the poems, and many of the wood-cuts from the illustrated editions. It is sold only in paper covers, but we believe the publishers would do well to offer it bound, at a fair increase of price.

A very useful book for druggists, nursery-men, seedsmen, and teachers and students of materia medica and botany, is *C. E. Hobbs's Botanical Handbook*, giving the common, botanical, and pharmacopœial names of vegetable drugs, etc. It is well arranged for purposes of reference, and seems to be very full and accurate. The advertisement will give a better idea of it than is possible in a brief notice like this.

The new *Cyclopædia of Chemistry* (Lippincott & Co.), mentioned in our last, has reached its tenth number, and the work is in all respects creditable to the contributors and publishers. It has now advanced far enough to show the thoroughness with which the vast range of subjects is being treated, and it can be confidently commended as fulfilling all the promises of the prospectus.

Lindsay and Blakiston, of Philadelphia, send us Parts 4 and 5 of the serial work on *Medicinal Plants*, by Professors Bentley and Trimen, which we have twice before noticed with emphatic approval. These parts contain colored plates of Brassica (Sinapis) nigra, Brassica alba, Linum usitatissimum, Ruta graveolens, Citrus limonum, Paullinia sorbilis, Dorema ancheri, Helleborus niger, Chondodendron tomentosum, Hæmatoxylon Campechianum, Hagenia Abyssinica, Datura stramonium, Atropa belladonna, and Ficus carica, two of the plates being double page. The price of the parts is $2.00 each, which is low, considering the character of the work.

The May-June number of the *International Review* sustains the high character of the periodical, which has now no superior on either side of the Atlantic. It is on our Clubbing List.

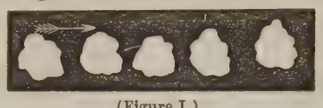
Medicine and Pharmacy.

AMŒBOID MOVEMENTS OF THE WHITE BLOOD CORPUSCLE IN MAN.

BY EPHRAIM CUTTER, M. D., CAMBRIDGE.

The blood has a liquid portion called serum, and a solid (or semi-solid) portion made up of circular discs, with an elevated edge very much like the wheels of the gyroscope, common some years ago. These are called corpuscles. There are two kinds, designated as *colored* and *colorless*, or red and white. The red corpuscles are very numerous. The *hematimètre*, an instrument for measuring the number of the red blood corpuscles, shows in one cubic inch of the blood of a male healthy adult, one hundred and thirty-five thousand millions (135,000,000,000) of these colored corpuscles, — a number that it is impossible for the human mind to comprehend. Or estimating the inhabitants of the globe at 1,500,000,000, then the red corpuscles in a cubic inch of blood are ninety times the number of the entire population of this world. The white or colorless corpuscles are about $\frac{1}{300}$ the number of the red corpuscles. They are truly named. Even when photographed with a $\frac{1}{50}$ inch objective to a magnitude of 1800 diameters, the colorless corpuscles show a beautiful white. The size of these corpuscles varies in different persons, and in the same person at different times. The red may be taken at $\frac{1}{3200}$ inch in diameter, and the white at $\frac{1}{1841}$ inch.

It is here intended to invite attention to peculiar characteristics of the white blood corpuscles, which consist in remarkable and impressive changes in shape and locomotion called *amœboid*. This word is derived from the Greek word *amoibe* (change), and by Webster is defined "an animalcule capable of undergoing many changes of form at will." Amœboid = like an amœba. Ehrenberg defines it as a genus of infusoria. The movements appear to be like those of an independent, free, and thinking being. They seem as if governed by the will. But how can we connect the idea of a will with such small bodies? It is proposed to show drawings made of the white blood corpuscles as more instructive and impressive than any description in words. Pardon a brief description of the process by which the accompanying drawings were taken. By the kindness of Mr. Emile Fontarive, 15 Pelham Street, Boston, the writer was allowed the use of a darkened room, to a window-shutter of which a solar microscope was attached. A microscope stand was then placed in the axis of the condensed sun's ray: A one-fifth objective, by Tolles, with the stage on its distal end, — "immersion without cover," as he calls it, — was attached to the stand, having first received a minute drop of blood covered with a "covering glass." The focusing was made with the fine adjustment of the objective, and the enlarged image was thrown upon a screen at first, and afterwards upon a board covered with drawing-paper. The amplification is about 600 diameters. After trying my own and the artist's blood without finding good specimens, we succeeded in obtaining what we desired from Mr. Fontarive. The artist, Mr. M. M. Tidd, of Boston, then sketched the outlines with the following results, copied by the pentagraph. The movements were very rapid and instantaneous, so that the artist had hard work to draw rapidly enough. The forms would change before his pencil could surround them. Still the figures here given show them quite well.



(Figure I.)

The series marked I. was taken from an active corpuscle which shied away and was hidden underneath the conglomerated red corpuscles, and of course was lost to observation. The figures do not give the locomotive movement, although they seem to do so. As fast as a figure was made, the paper was pushed along to receive the image upon a new place as rapidly as possible. There was a locomotion, but it is not apparent. The writer has seen (and it is confirmed by three observers at the same time) a white blood corpuscle move on a track of an inverted V, starting from the end of the left-hand branch, travelling upwards to the angle, then along the other branch to the end, and then also coalescing with another white corpuscle located there. During the march it travelled an apparent distance on the field equal to more than the diameter of this field, and divided itself up as follows: —

(1.) Into two and then reunited,
(2.) Into three, " "
(3.) Into four, " "
(4.) Into six, " "

and at last it landed as above, in one.

(Figure II.)

This shows thirty-eight changes in form of one corpuscle. The outline is varied in each case. Reëntrant angles, projections, fissures, divisions into two and more parts, separation of these parts and coalescence, — these amœboid changes were made very rapidly.

(Figure III.)

This shows forty-two changes of one corpuscle. It depicts divisions, reunions, protrusions, retractions, in a very weird manner. The movements were more rapid than in I. or II.

Says Beale, "The cause of these movements is unknown, if not unknowable." One cannot observe them without a feeling of awe. Dr. Salisbury says they are best seen in the spleen of the living turtle, and that such as we have depicted are but the motions of the *dying* cell. If this is so, what astonishing changes must be going on within us at all times. How they reconcile us to the modern doctrine of the migrations of the white corpuscle to form pus. Indeed, when one sees the openings in the epithelium of the blood-vessels (perhaps they may be shown in this journal at some future time), and then compares them with the amœboid movements, the wonder is how they stay in the vessels at all.

It may be added that the figures presented give only a partial idea, and that the imagination may exercise its utmost stretch and yet fall short of the reality. Any one can study these forms for himself, as it requires only a dark room, a mirror for reflection of the solar beam, a photograph objective for a condenser, a low-power objective, and the simplest stand of the compound microscope. The blood exists in abundance in the person of the observer.

"BARK AND IRON."

Bark and iron are unquestionably the most valuable of the vegetable and the mineral tonics respectively. Cinchona bark was brought to Europe from Peru as early as 1639, and in 1677 it was introduced into the London Pharmacopœia under the name of *Cortex Peruanus;* so that the bi-centennial of its formal recognition as a part of the English *materia medica* might well be celebrated next year. During these two centuries its use and its reputation have rapidly increased, until now it ranks second to no therapeutical agent derived from the vegetable kingdom.

Iron holds a similar position among mineral tonics. It is, indeed, more than a tonic, for besides the general corroborant action which it exerts in common with other agents of its class, it exercises a restorative influence on the composition of the blood by increasing the number of its red corpuscles and the amount of its solid constituents. As a recent medical writer has well said, it is "to be considered as a nutrient rather than a medicine."

The idea of uniting these important therapeutical agents in a compound in which the active medicinal principles of both should be fully preserved was first suggested, in 1857, by the founder of the house of which Billings, Clapp, & Co. are the successors. The preparation is widely known as "Bark and Iron," and has been a favorite remedy with physicians for almost a quarter of a century. Although many imitations of this article, under various names, have since been offered to the public, yet they differ essentially from the original, which is prepared exclusively by Billings, Clapp, & Co., of Boston, the successors of Jas. R. Nichols & Co. No article without their trade-mark, though it bear a similar name, should be substituted for this standard and long-established preparation.

The University of Geneva, which has recently reorganized its faculty, has tendered the chair of Physiology to Dr. C. E. Brown-Séquard.

THE NATIVE PHYSICIANS OF BRITISH INDIA.

It is a curious fact that, in spite of all that has been done in India to propagate European medical knowledge, the native population have a great contempt for it. As Dr. Balfour remarks, "It may truly be said that medical science as now taught in Europe has in India not even begun to displace the theories which Churaba, Susruta, Hippocrates, and Galen promulgated two and three thousand years ago." It seems that the native Hindu physicians possess a system laid down by Sanskrit writers at least 500 years before Christ, and having much in common with the early medicine of the Greeks; while the Mohammedans, who came into India only 800 or 900 years ago, have a system based on the Arabian writers who flourished after the downfall of the Greek philosophy.

A Madras correspondent of the *London Medical Times and Gazette* has been "interviewing" some of these native practitioners, and we are confident that the following extracts from his report of the results will interest many readers of the Journal: —

I got a friend amongst the native Christian clergy to bring one to call upon me, and have a talk upon medical matters. Accordingly, my friend called early one morning, bringing with him T. Veloithum Pandárum, a Hindu Vydian or physician, practising largely in one of the suburbs of Madras. A courteous gentleman he was, in most unpretending native dress; and, after a few compliments, which my friend interpreted, I told him I was not very well, and invited him to feel my pulse. The recognized method of doing this is very exact and circumstantial. The doctor gently took both the fingers and thumb of my right hand into his right, so as to hold the hand steady, whilst he placed three fingers of his left hand on my pulse just above the wrist. Then he proceeded with great deliberation, raising each finger in turn, so as to compare the force of the pulse under each finger; then he pronounced my malady to be heat and bile. In answer to my question, he said there are three pulses at the wrist, felt by the physician's three fingers. That nearest the wrist is caused by wind, and its characters show excess or deficiency of that principle; the next finger is over the pulse caused by bile; the third over that caused by phlegm. Each pulse has several distinct kinds of motion, which are comparable to the movements of animals: thus, some pulses seem to crawl as a snake does; others to strut like a peacock, or waddle like a goose; and from these several characters valuable hints are got as to the nature of the disease. We had a long conversation, in the course of which I could not help admiring the cleverness with which my friend evaded any awkward questions; for instance, he refused to give me any definite opinion on my own maladies because the hour of the day was past at which a sick man ought to be visited and examined. I do not doubt but that he has a stock of useful remedies for various common maladies and symptoms, which may properly be called *nostrums*, as they have been handed down from father to son in his own family for generations. In the treatment of fever he adheres at first to the native practice of absolute fasting, hoping that the fire will die out if deprived of fuel; but has no prejudice against quinine, and uses it "in the proper cases." He repudiates the necessity of any religious invocations or formulæ during the preparation or administration of medicines. Asking him what would do good to a loose cough, which plagued the native clergymen, he gave a receipt containing various spices, powdered and made into a confection with ghee, and I should think it a good remedy. So, after some more comments on general topics, the Vydian took his leave.

Now let us look at the Mohammedan Hakim. There is a resident lady who is conspicuous for her knowledge of native languages and for her activity in the management of all the charitable institutions, and therefore is eminently well known and popular amongst all classes. So I told her my wish, and straightway was invited to meet a Mohammedan Hakim at her house. I should rather say *the* Hakim, — Jawand Hoossain Khan, — for, like the "Last Minstrel" of Sir Walter Scott, he is the sole remaining representative of a once numerous and learned body. . . . The Mussulmans are impoverished and out of heart, and of their physicians this one only is left. He is a dignified and enthusiastic-looking man, who told me in good English that he was the son of the late physician to the Nawab, but that he did not intend to bring up his own son to medicine. He had, before studying medicine, received a thorough education in philosophy and logic, which he looked upon as an indispensable preparation. He showed me a large number of authoritative treatises on the different branches of medical principles and practice, in Arabic and Persian, all beautifully written with his own hand; besides a MS. treatise on the British Constitution, in English. There was a kind of Compendium of Medical Science which the medical pupil was required to learn by heart, and recite to his preceptor. Of course the pupil could not understand it; but the master refused all explanation till the pupil could recite the whole. This is a favorite method of education amongst Orientals. All practice, he said, must be founded upon correct principles; and these were to be found in the works of authoritative writers, and applied according to the rules of philosophy and logic. "Don't ask me," he said, "how to treat *fever*, but show me the patient, and let me examine all his organs, and inquire into his temperament, and the causes; and then I will treat the patient; but it is absurd to prescribe for the name of a disease." "Do you use quinine?" I asked. "Certainly not; it is a mere English remedy, unknown to our best authors. Besides, I do not know its composition; and no physician ought to use a drug whose composition and operation he knows not." "Did you ever dissect?" I inquired. "Oh dear, no!" said the Hakim with a smile. "Why should I? Are not the organs all described in our books? And, besides, it is against the precepts of our religion." Then we fell into a talk about the heart, which he described as consisting of *mutton* (the commonest word used here for flesh) and membrane, with certain cavities; its function is to serve as a central heat to the body; whilst the lungs operate as ventilators to cool it. "How do you describe the circulation of the blood?" I asked. "There is no circulation of the blood," was his reply; "but some blood goes to the liver, some to the lungs," and so on, just as Galen described it. The Hakim absolutely refused to feel my pulse, on the plea that it was not the proper time of the day, and displayed great ingenuity in evading any question he did not care to answer. . . .

We talked of wine, and I asked if he did not think it a valuable stimulant. "Perhaps," he said; "but we have much better remedies. In case of extreme weakness, we give powdered pearls — nay, sometimes rubies or even diamonds; and these are much better modes of keeping up the vital heat; besides that, wine is forbidden by our Prophet."

I parted from the Hakim with immense respect for his industry and abilities. He is a thorough gentleman in manners; knows English pretty well, besides the languages necessary for Mohammedans, as Arabic, Persian, and Hindustani; is acutely logical, and of tenacious memory; but the philosophical and medical systems to which he has devoted his life are like the mere hollow, barren trunks of trees whose growth was stopped, and their heart rotten, centuries ago.

"THE THUNDERER" ON TYPHOID.

The following article from the London *Times* bears internal evidence of being from an able medical pen, and we reprint it as a clear and succinct summary of what is at present known concerning the causes of typhoid fever: —

"Typhoid" or "enteric" fever is the common fever of this country, which spares neither age, sex, nor social condition, which destroyed the life of the prince consort, and nearly destroyed that of the Prince of Wales, which destroys an average of about 10,000 or 12,000 people annually, and which sickens and endangers about 100,000 more. It is essentially an eruptive disease of the lining membrane of the intestines; a sort of small-pox, which affects the bowels instead of the skin; and, like some other eruptive diseases, its destiny is to run a definite course over a stated period of time. It is spread abroad chiefly, and probably exclusively, by the discharges from its specific eruption — that is to say, by the discharges from the intestine. These, in the natural course of things, find their way into cesspools and sewers, and when they do so they render poisonous the solid or liquid contents of the receptacles, and also the gas which is evolved from them. The fever is reproduced mainly in three ways: first, by the poisoned sewage obtaining direct access to drinking-water, by leakage or soaking, and so being swallowed; secondly, by the poisoned gas escaping from sewers into water-mains or cisterns, so that it is absorbed or dissolved by the water, and so swallowed; thirdly, by the poisoned gas making its way through badly trapped drains or other channels, into dwelling or sleeping rooms, and so being breathed by the occupants. To one or other of these methods of diffusion every outbreak of typhoid fever may be referred, and nearly every single case, the tendency of modern research, by increasing our knowledge of the outlets for sewer poison, and of the distances which it may travel unchanged, being constantly to bring apparent exceptions within the general rule. Hence two things are manifest: first, that typhoid fever is very little infectious in the ordinary sense, or through the atmosphere which surrounds the patient; secondly, that it is very actively infectious through concealed channels of indefinite length or tortuousness, so that B may derive his fever directly from A, of whose very existence he is ignorant. The connections which constantly exist between sewers or cesspools and the water or air supply of dwellings, however disagreeable or disgusting, are harmless, as far as the production of typhoid is concerned, until the sewers or cesspools have themselves received the typhoid poison. In towns which have an intermittent water supply, and in which mains and sewers lie in close proximity in the streets, as soon as the mains are empty of water they become filled by the sewage gas, which makes its way through chinks; and in the many houses in which an untrapped overflow pipe descends from the cistern to the sewer, the gas ascends by this pipe, and the water contained in the cistern is always more or less contaminated. In both cases the water may be made to stink, or it may be rendered more or less unpalatable or unwholesome, but it does not become a source of typhoid until typhoid poison has been cast into the sewer. There are few villages in which there is not continued soaking from cesspools to wells, but this soakage is likewise — *quâ* typhoid — harmless until the specific material is supplied. The danger of such structural defects is that they leave an open door for the entrance of the typhoid

poison whenever it does get into the sewers, and the typhoid poison is so widely diffused in this country that it is never safe to speculate upon its absence. When the fever appears, the only question is, practically speaking, "How and when does the sufferer drink water which was contaminated by typhoid-tainted sewage, or breathe air with which typhoid-tainted sewer gas was mingled?" All the popular talk about "exposure to cold," or about "bad smells," or "over fatigue," or other vague speculations of like kind are entirely erroneous and misleading. Typhoid may be assumed, for all practical purposes, to spring only from antecedent typhoid, and to come only by the path of sewage pollution. If it ever does arrive *de novo*, the cases are entirely exceptional, and we have no certain evidence of their occurrence.

DIPHTHERIA.

BY DR. EDWARD H. SHOLL, OF GAINESVILLE, ALA.

Some five or more years since, my attention was called to an article on this subject in my weekly companion, the *Medical and Surgical Reporter*, of Philadelphia, by a physician of Philadelphia, whose name I do not now recall, directing attention to the use of the liquor potassæ in the disease. He, having instituted a series of experiments to find the best and quickest solvent of the detached diphtheritic membrane, soon ascertained this to be the liquor potassæ. Reasoning properly, he began its internal use, and with such success as led him to publish the results of treatment.

Not satisfied with any treatment pursued in my practice prior to that time, the resolution was made to test this. An opportunity was soon afforded in a case of adult male, and of extreme severity. To be certain, four physicians were called to examine and diagnose the case. All agreed as to its specific nature. For more than twenty-four hours the disease was treated with iron, chlorate of potash, ammonia, etc., the symptoms of debility, with local invasion of throat, rapidly increasing. All previous medication was suspended, and he was put upon the use of the liquor potassæ alone, in twenty-drop doses every three hours. In thirty-six hours every trace of the membranous deposit in the throat was gone, and the fever was subsiding. The patient went on to speedy convalescence, and was soon able to leave my office, where I had kept him in order to conduct the experiment accurately. Since that time the remedy has been used with like result in every case of diphtheria coming under my care, given in doses suitable to age, every three hours. Usually in the early stage I alternate it with a four-ounce saturated solution of chlorate of potash, to which is added one fluid drachm of hydrochloric acid and two of tincture of iron, of which a small teaspoonful, properly diluted, may be given to a child six years old every three hours, allowing thus an hour and a half between the different medicines. When the membrane disappears, the iron mixture is discontinued, and an emulsion of cod-liver oil and syrup of lactophosphate of lime used till strength is restored. The liquor potassæ is continued as long as the membrane is present, and until fever entirely gives way. It may be said that the adjunct treatment is important. This is conceded, or it would not be used, but eliminate the liquor potassæ from the treatment, and results will soon show which is the controlling factor in the solution of the problem.

I have recently dismissed convalescent a case treated by this method, which, arguing from its antecedents, it does not seem could have been led to a successful issue in any other way. I never use any local treatment, having abandoned it ten years since. It is not claimed for this remedy that it is a specific, — that were folly; but when the wails of weeping mothers are going up over the land, it is well that the physician be supplied with every means of fighting this terrible scourge.

I pen this article because I have found that many of my professional brethren have never heard of this treatment, and because the aggregate of human experience has for its sum earthly wisdom.

MEDICAL MEMORANDA.

Solubility of Salicylic Acid. — A Parisian medical journal informs us that at a late meeting of the Therapeutical Society, M. Chassan, a *pharmacien*, stated that he has found the addition of citrate of ammonia to greatly increase the solubility of this acid, either in alcohol or in water. Thus, while 40 or 50 parts of rum are required to dissolve 2 of the acid, if 1 part of the citrate of ammonia be added, only 8 parts of rum are required to dissolve the 2 parts. If from 2 to 3½ parts of the citrate be added, 120 parts of water will dissolve 2 parts of the acid; while without this addition 1000 parts of water would have been required. M. Chassan proposes the following formula: Salicylic acid 4, citrate of ammonia 2, rum 30, and distilled water 164 parts; or this: Salicylic acid 1, citrate of ammonia 2, syrup 30, and distilled water 120 parts.

"Over-Training." — The *Pall Mall Gazette* remarks: "One of the reasons assigned for the defeat of the Oxford crew in the boat-race on April 8th is that they were 'over-trained.' Whether this were the case or not, there can hardly be a doubt that the science of 'training,' like many other sciences, is yet in its infancy, and that the course of training followed as a rule by those who are preparing for the performance of athletic feats, even if effectual for the purpose for which it is adopted, is not conducive in the long run to good health or longevity. Indeed, it will be found that many, if not the majority, of those who attain unusual length of years almost invariably indulge in one or more habits pronounced by medical experts to be decidedly unwholesome. It is a notorious fact that octogenarians, and even 'reputed centenarians,' are often inveterate smokers, and must, according to accepted medical theory, be thoroughly saturated with nicotine by the time they are laid in their graves. Some habitual topers, even, live to a very old age, and others who take no exercise worthy of the name enjoy perfect health, and last many years longer than their more active contemporaries. One of the most remarkable instances on record of admirable health and longevity, notwithstanding a departure from those rules of temperance and exercise which are supposed to exercise such an important influence on health, is that of the Rev. William Davies, rector of Staunton-upon-Wye, and vicar of All Saints', Hereford, who died in 1790, aged 105. This reverend old gentleman, during the last thirty-five years of his life, never took any other exercise than that of shuffling his feet from one room to another, where he would sit till bedtime. He always ate hot buttered rolls for breakfast, an enormous dinner consisting of a variety of dishes, and a supper of hot roast meat, besides drinking a liberal allowance of wine. He never suffered from gout, rheumatism, or indeed from any other disease or infirmity. His temper was jovial to the last, and he passed away with a chuckle, without apparent suffering, universally beloved and respected."

Medical Errors in Shakespeare. — The profound psychology of Shakespeare, even where it embraces matters of medical science, often excites one's admiration. Still, his writings are not without medical errors, though these are very few. Thus, as M. Onimus points out in the *Revue des Deux Mondes*, the poisonous action of henbane, as depicted by the ghost in "Hamlet," is far from exact; it is impossible that this substance poured into the ear of a sleeping man could immediately produce ulcers and cause death. Shakespeare specifies with care the nature and effects of the poison and thus lays himself open to such criticism. But his great mistake is in the scene where Desdemona is suffocated by Othello with the pillow. The death is represented as solely by asphyxia; no other kind of violence is used. If the mechanical cause were removed, life would immediately return, even though the asphyxia were nearly complete. Any one deprived of air some time would yet escape death if he could respire again. Now, after being suffocated, Desdemona protests her innocence and excuses Othello. If she could speak, of course she breathed, and if she breathed, it was impossible she should die asphyxiated. We can readily suppose Shakespeare would be averse to making Desdemona die by a bloody act, which would mutilate the fair form. But, as the matter stands, the last words of Desdemona should have been suppressed.

Camphorated Ether in Erysipelas. — According to Cavazzani, a preparation consisting of camphor and tannin, of each one part, and ether eight parts, is an excellent application, even in cases of phlegmonous erysipelas. It is also very efficacious in burns of the first and second degrees; the heat disappears rapidly, and blisters do not form. It should be applied every three hours.

SELECT FORMULÆ.

Cincho-Quinine, Strychnia, and Iron. — The following elegant combination of these valuable remedies is the prescription of Dr. J. H. Stephenson, of Leesville, Ohio, who has found it to produce the most favorable results. Take of

Cincho-quinine	64 grs.
Strychnia	4 grs.
Chloride iron tincture	18 fl. drs.
Syrup	q. s.

Triturate the cincho-quinine and strychnia in a glass mortar, adding the tincture of iron gradually and a few drops of nitric acid if necessary, until they are dissolved; filter, and add syrup to make the finished preparation measure one pint.

Camphorated Tincture of Opium. — To prepare this, substituting tincture of opium for powdered opium, take of

Alcohol	15 fl. ozs. 96 m.
Water	15 fl. ozs. 96 m.
Opium tincture	12 fl. drs 48 m.
Benzoic acid	60 grs.
Camphor	40 grs.
Anise oil	1 fl. dr.
Honey	2 ozs.

Dissolve the benzoic acid, camphor, and anise oil in the alcohol, and the honey in the water. Mix the solutions, add the opium tincture, and filter.

Wanted. — A situation, to take charge of an apothecary store, by a graduate in pharmacy, of six years' experience. Country preferred. Address A. B. C., care Boston Journal of Chemistry.

Wanted. — A physician, with a fair practice in a large manufacturing village, for reasons of a personal character, is desirous of locating elsewhere. Would exchange places with any one desiring a change, or otherwise. A village in a farming community preferred. Communications strictly confidential. Address "Liberality," care of Journal of Chemistry.

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